

REFERENCE COPY

DO NOT REMOVE
FROM THIS ROOM

Sharing Printers on The LAN: 18 Print Servers to Help You Cut Costs

Free Utility:
CHANGER Makes
Your Windows
Desktop Exciting



10 Powerful
Nonprogrammable
Database Systems

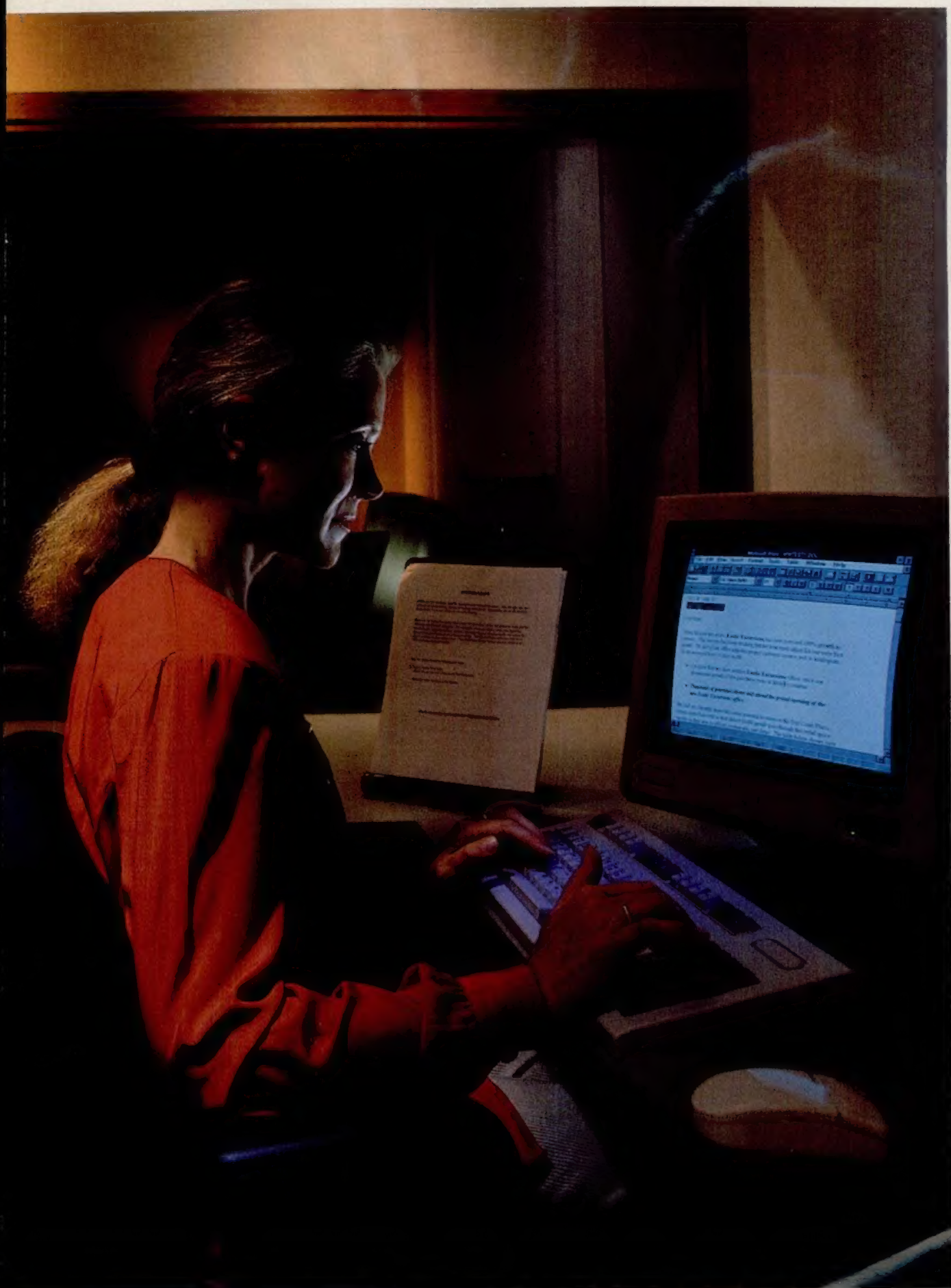
The New Speed Limit:

**PC Labs Tests 74 of the Fastest
PCs We've Ever Driven**

DX2/66



It's not surprising
that WordPerfect
users are switching
to Microsoft Word
for Windows.



For Xbase Roads Lead

It's been a very difficult and confusing couple of years for Xbase developers. Filled with uncertainty and doubt about the future. At times, some questioned whether Xbase even had a future.

But those days are over.

With the resources, experience and support of the world's leading database company behind it, and with the combined technological wealth of CA-Clipper, CA-dBFast™ and Computer Associates, the future of Xbase has never looked brighter.

CA-Clipper



Millions Of Clipper, dBASE, Fox And CA-dBFast Developers Head For The Next Generation Xbase System.

To build the Xbase system of the future, we've added CA's visual tool and client-server technology to Nantucket's next generation Xbase project.

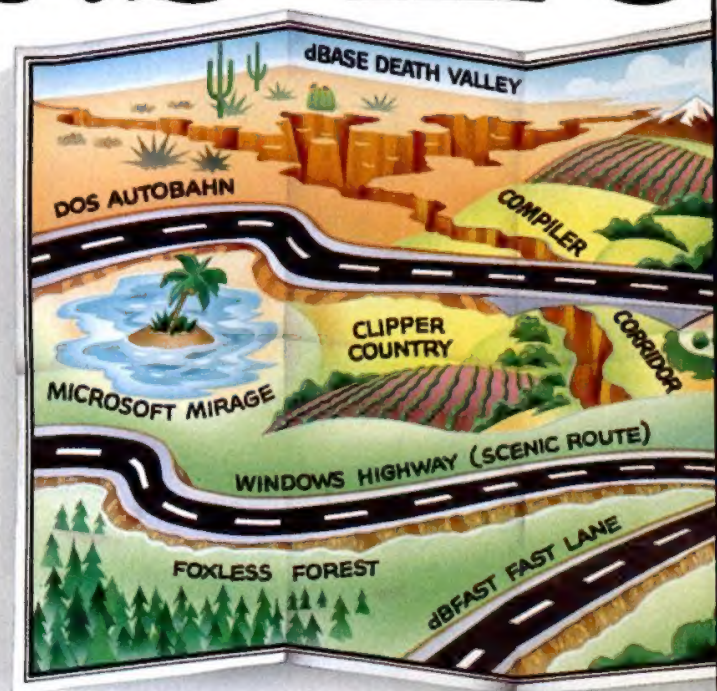


This new system will provide a fully object-oriented Xbase language, native code compiler, an IDE (Integrated Development Environment) and both DBF-style and client-server database support.

It will support Windows, Windows NT, OS/2 and UNIX. The complete product will be demonstrated at Fall Comdex and available for beta testing in the fourth quarter of 1992.

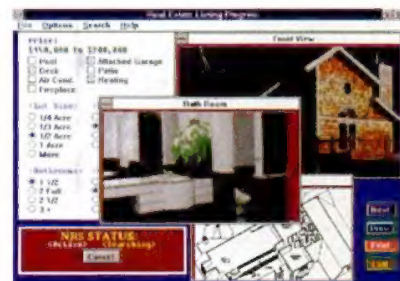
Two Easy Ways To Get There: Go GUI Today With CA-dBFast Or Go The DOS Route With OOP Via Clipper. Your Choice.

There are two migration paths to this ultimate Xbase system: The OOP (Object-Oriented Programming) path of



CA-Clipper and the GUI (Graphical User Interface) path of CA-dBFast with Windows support.

Both paths will provide immediate benefits and will protect and leverage the substantial investments you've made in Xbase.



Attention All dBASE IV Developers: Your CA-Clipper/Compiler Kit Has Arrived.

After four years, the compiler kit you've been waiting

se All ad To CA.

Secure Your Future When You Team Up With The World's Leading Database Software Company.

Much more than a PC software company, CA is the world's leading database software company. CA software is used in over 70 countries around the world by more than 10 million users including over 90% of the Fortune 500.

From mainframe to midrange to microcomputers, CA database software runs on more platforms, more operating systems, and handles more mission-critical applications than any other software in the world.



CA's Computing
Architecture
For The 90s.

For Information On CA-Clipper, CA-dBFast And A Statement Of Direction: Call 1-800 CALL CAI.

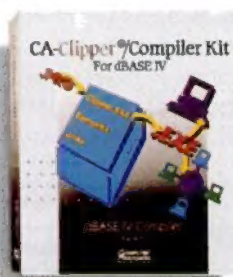
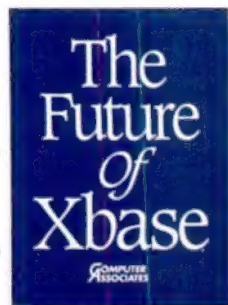
To get the complete story on The Future of Xbase, call for this special 30-page statement of direction.

It contains an Executive Summary as well as an in-depth discussion of Xbase in the 90s, CA's

Open and Client-Server Architectures, Integrated Development Environment, Xbase migration plans and end-user tools.

Call for your copy today.

And find out why the future of Xbase will lead you right to CA.



for has arrived. Introducing new CA-Clipper/Compiler Kit For dBASE IV. The easiest, quickest way in the world to compile a dBASE IV application.

All it takes is three easy steps. And in just minutes, you can turn most dBASE IV programs into faster running, higher performance programs.

The new CA-Clipper/Compiler Kit For dBASE IV provides compatibility and database interoperability with most dBASE IV applications. The Kit is implemented using the open architecture of CA-Clipper, including the preprocessor, the Extend System and the RDDs.

ViVa 14.4

\$449

- V.32bis Modem
- 14.4/FAX Group 3
- Hayes Compatible
- 57,600bps Data Throughput
- 8 Status Icons
- V.42bis & MNP5 Data Compression
- V.42/MNP 2-4 Error Correction
- EIA/TIA Class 1 & 2 FAX
- 65% Less Desk Space
- Asynchronous & Synchronous
- 5 YEAR WARRANTY

Call Now! **800-854-7600**

COMPUTER PERIPHERALS, INC.

667 Rancho Conejo Blvd.
Newbury Park, CA 91320



ACTUAL SIZE

ViVa, Computer Peripherals, Inc.
and Hayes are registered trademarks.

CIRCLE 105 ON READER SERVICE CARD

Inside

PC reviews are our bread and butter. We devote more editorial pages to them than to any other topic, partly because there are more products in this category than any other and partly because everything we do has to start with

a PC. But there's nothing routine about PCs. Sure, the basic list of components in a PC doesn't change much: a motherboard, a controller card, disk drives, and video boards.

However, there's much technological ferment about components nowadays. Motherboards and CPUs are often upgradable. Controllers and motherboards have caches built in to speed performance. Video boards are tuned up to handle the graphical

ness Tokyo, a now-defunct magazine about doing business with Japan, before joining our staff. He's also worked at *Popular Science* and at *Chemical Business*.

By coincidence, both Nadel and PC team project leader Jonathan Hill earned degrees in chemistry, worked as research chemists, and have their names on patents held by former employers. Hill's career as a chemist went downhill after the first PC showed up in his lab. He was

soon the guru that everyone else came to for help. He started consulting for us last April and joined the staff full-time in August.

The reviews of DX2/66 systems in this issue cover some of the fastest machines that we've ever tested. Both Nadel and Hill were impressed by the price/performance numbers of these computers.

"You can get a lot for \$2,000," says Nadel. Hill notes that new graphics accelerator cards and on-board graphics chips make video performance really pop: "Some of these machines are so fast, they make Windows run as fast as a DOS program."

Now that is fast.

—Joel Dreyfuss



New gurus of the PC team: Nadel and Hill.

interfaces or put directly on the motherboard. Disk drives get quicker and smaller.

"Things change so fast it's hard to keep up," says Brian Nadel, our man whose job is to keep up with PCs. Nadel joined *PC Magazine* in September as associate editor for PC reviews. He's well prepared for the task. He was technology editor at *Busi-*

PC Magazine: The Independent Guide to Personal Computing. ISSN #0888-8507 is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave., New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80321-4093.

CA-REALIZER—Now For A Limited Time Only \$99.

Above And Beyond Basic.

INTRODUCING
THE EASIEST BASIC
DEVELOPMENT
SYSTEM FOR
WINDOWS.

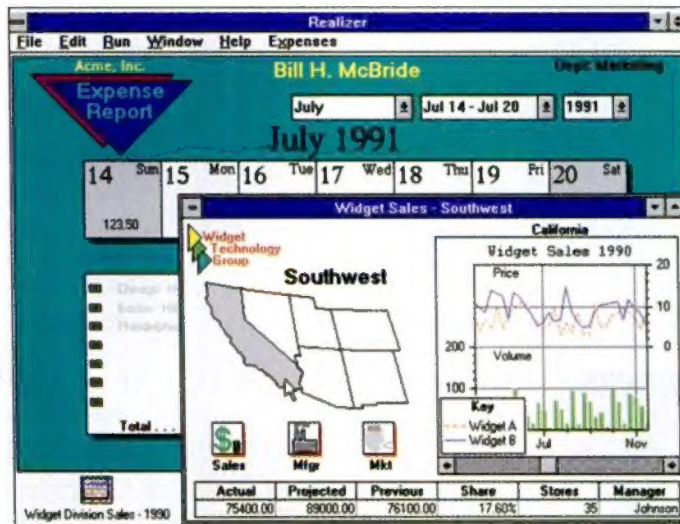
Compared to Visual
BASIC, CA-REALIZER® is
half the cost and twice
the product.

Develop applications
using the familiar proce-
dural language model and
a large array of powerful
tools. You don't need to
learn all kinds of confus-
ing new techniques. Just
type in programs or
design them visually with FormDev. It's an interactive

WYSIWYG, point and click tool
that generates code. With a single
command you can add
Programmable Application Tools
like spreadsheets, charts, text edi-
tors, animation, graphics tablets
and user-friendly forms. And
CA-REALIZER offers many fea-
tures other BASICs don't, like
automatic array processing.

Arrays are re-dimensioned and processed automatically.
Algorithms can be written as formulae instead of com-
plex looped expressions.

Once an application is complete, you can compile it
into a stand-alone Windows application and distribute it



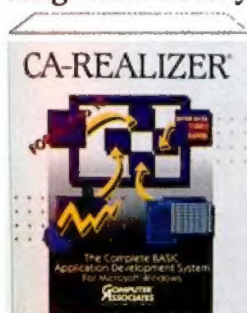
royalty-free with the run-
time module that's includ-
ed. And you can generate
an installation disk with
the push of a button.

PC Computing said, "No
other Windows BASIC can
match it for power and
breadth of features."



And at \$99, they can't
match the price either.

So call 1-800 CALL CAI
today for more information
and the name of your nearest dealer.



Arrays are re-dimensioned and processed automatically.
Algorithms can be written as formulae instead of com-
plex looped expressions.

Once an application is complete, you can compile it
into a stand-alone Windows application and distribute it

	REALIZER	Visual BASIC
Interactive WYSIWYG Application & Form Designer	✓	✓
Generates User Accessible & Modifiable BASIC Code	✓	
Familiar Procedural Programming Model	✓	
Integrated Full-Featured Debugger	✓	
Single-Stepping, Call-Tree, Variable Display	✓	
Automatically Expandable Dynamic Arrays	✓	
Full Range Of Fast Array Operators & Functions	✓	
Mathematical, Statistical, Date-Time Functions	✓	
Dynamic Addition & Removal Of Form Objects	✓	
Fully-Integrated Programmable Application Tools:	✓	
Charts, Spreadsheets, Text Editors, Graphics, Animation, Scheduler	✓	
Ability To Run Multiple Applications Simultaneously	✓	
Full Support For DDE & DLLs	✓	✓
Direct MDI Support & Serial Communications Library	✓	
Import/Export Of 1-2-3, Excel, CA-SuperCalc Files	✓	
Extensive Context-Sensitive On-Line Help	✓	✓
Clip Art Library With Over 250 Bitmaps	✓	
QuickBASIC Version 7.0 Compatibility Libraries	✓	

Don't waste another day trying
to figure out Visual BASIC.
Leave that for your competition.

COMPUTER ASSOCIATES
Software superior by design.

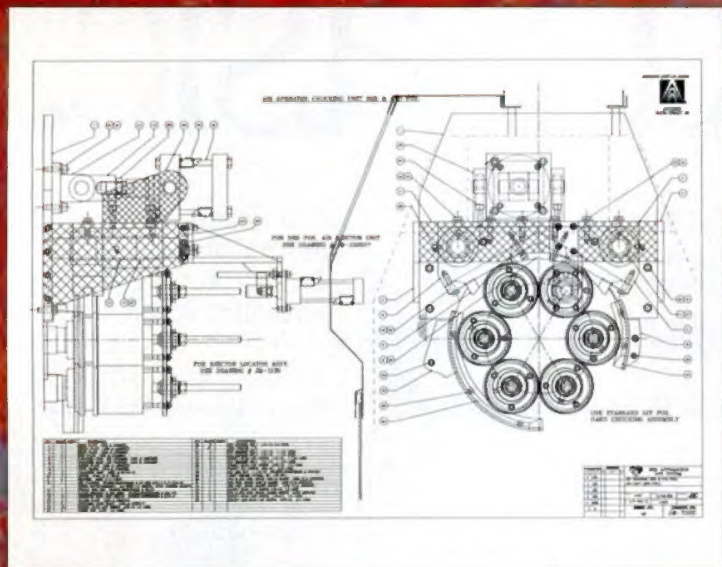
CA-Realizer

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies.
CA-REALIZER Release 1.0 and Visual BASIC Release 1.0 compared 10/92. Cost comparison based on Visual BASIC Release 1.0 Suggested Retail Price. PC Computing quote appeared 10/91, pg. 90.

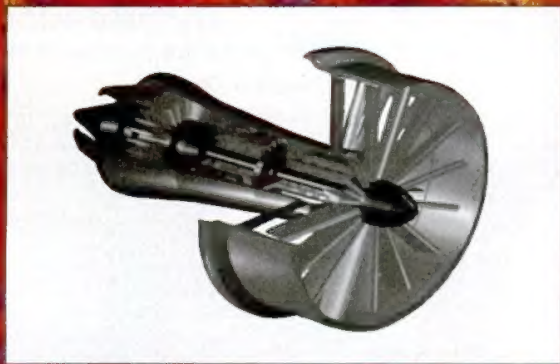
CIRCLE 381 ON READER SERVICE CARD

ProTracer. Where the qualities of a laser printer meet the output of a large format plotter.

C-size (17" x 22")



B-size (11" x 17")



A-size (8.5" x 11")



Laser printers offer so much. Like high quality output, speed, desktop convenience and, of course, a low price. Large format plotters, on the other hand, give you the output size you need for certain drawings and applications. What we've done is pulled all of these features together to create ProTracer™ — a personal printer and plotter that produces A, B, and C-size output at an impressive 360 dpi resolution.

FEATURES INCLUDE:

- ▶ High performance Canon® inkjet engine
- ▶ Fast, Intel i960™ processor—drawings that take over one half hour on pen plotters take as little as five minutes on ProTracer!
- ▶ Optional accessories including a new, faster HP-GL® language emulation card, PostScript® language emulation, memory expansion boards, and sheet feeders
- ▶ Full vellum capabilities
- ▶ Unsurpassed customer service — 60-day money back guarantee, one year warranty, and unlimited technical support

ProTracer base unit

- ▶ Customized ADI and PADI drivers for AutoCAD users
- ▶ Epson and ProPrinter emulations

\$1499

ProTracer with HP-GL

- ▶ ProTracer base unit
- ▶ HP-GL emulation card plus memory

\$2249

ProTracer with PostScript emulation

- ▶ ProTracer base unit
- ▶ PostScript language emulation card
- ▶ 8 MB memory

\$2897



For the bigger picture, call Pacific Data Products at (619) 625-3573, Fax (619) 552-0889.



**PACIFIC DATA
PRODUCTS**

Pacific Data Products, Inc., 9125 Reber Rd., San Diego, CA 92121. In Europe, call (353) 61 475609. ProTracer is a trademark of Pacific Data Products, Inc. All other brands and product names are trademarks or registered trademarks of their respective manufacturers. Image courtesy of Autodesk Inc. ProTracer uses PeerlessPage™, the advanced imaging Operating System from Peerless. PhoenixPage is a registered trademark of Phoenix Technologies Ltd. © 1992 Pacific Data Products, Inc.

UP FRONT

Inside

The right chemistry for PC reviews.....4

Letters

Readers comment on Windows versus OS/2.....19

Trends

- Database API skirmish
- PCMCIA slot takes off
- Windows going mobile
- IBM's PDA to arrive
- PDQ.....29

First Looks

- Microsoft Access
- Sharp OZ-9600 Wizard
- IBM Color Jetprinter PS 4079.....37

New and Improved

BY E. ANDREW TORGAN.....59

Read Only

EDITED BY CAROL LEVIN.....71

Toolkits

EDITED BY TRUDY NEUHAUS.....77

COLUMNISTS

Michael J. Miller

The Best Software Is a Drag.....81

Bill Machrone

Secrets in Your Socket.....87

John C. Dvorak

Privacy, Schmivacy.....93
Inside Track.....95

Jim Seymour

Making Multimedia Work...99

Bill Howard

Local Bus: The Better Video Choice.....105

Cover Photography by Jeffrey Krein

COVER STORY

Windows Workstations: DX2/66—The New Speed Limit



BY JIM SEYMOUR To run today's graphics-intensive software properly, you need a PC with power to spare. PC Magazine Labs reviews 74 desktop systems based on Intel's 486DX2/66 processor in search of the ultimate Windows workstation.....110

AcerPower 486e DX2/66 Model 5657.....125	Edge 466 Magnum.....190	NEC Express DX2/66e.....209
ALR Flyer 32DT 4DX2/66.....125	EPS ISA 486 DX2/66.....191	NETis Ultra WinStation N466L.....210
American Mitac TL4466.....148	Everex Tempo M Series 486 DX2/66.....191	Northgate SlimLine ZXP.....210
American Super Computer 486X2/e66.....148	Expo 486 dX2/66.....192	Occidental 66MHz 486DX2.....211
Arche Legacy 486/66DX2.....150	FCS 486-66.....192	Osicom i466 MOD 420.....211
Ares 486-66DX2 VL-Bus.....155	FutureTech System 462E.....193	PC Brand Leader Cache 486/DX2-66.....212
Ariel 486DX2-66V/LB.....155	Gateway 2000 4DX2-66V.....193	PC Pros 486/66DX2 5550T.....221
AST Bravo 4/66d.....161	GCH EasyData 486DX-2/66.....194	PCS Double Pro-66.....221
ATronics ATI-486-66.....165	Gecco 466E.....197	Poly 486-66LM.....222
Austin 466DX2 WinStation.....171	HP Vectra 486/66U.....197	QSI Klonimus 486DX2/66.....222
Bi-Link Desktop i486DX2/66.....173	Hyundai 466D2.....198	Qtech 486 4D2/66.....223
BLK 486DX2/66.....175	IBM PS/2 Model 77 486DX2.....198	Silicon Pylon II 486DXi-212.....230
Blue Star 466D2U.....175	IDS 466i2.....200	SST 486DX2-66MWC.....230
BOSS 466d.....178	Insight 486DX2-66I.....199	Standard Windows Workstation Plus.....231
Broadax 486DX2-66.....178	International Instrumentation Blue Max Monolith 486D2/66UP.....200	Swan 486DX2-66DB.....232
C ⁺ Saber 486/e DX2-66.....179	Keydata 486DX2-66 KeyStation.....201	Tangent Model 466ex.....232
CAF Gold 6D2.....179	Lightning ThunderBox.....202	Tri-Star 66/DX2-VL.....234
Clover 486 Quick-I Series.....180	LodeStar 486-DX2/66 EISA WinStation.....201	Twinhead Superset 600/462D.....234
Comex 486DX2/66.....181	Mega Impact 486DX2/66E+.....202	USA Flex 486DX2/66.....236
Compaq Deskpro 66M.....181	Memorex Telex 8092-66.....204	U.S. Micro Jet 486DX2-66.....245
CompuAdd 466E.....182	Micro Express ME 486-Local Bus/DX2/66.....206	Wyse Decision 486si.....245
CompuAdd Express 466DX2 Scalable.....182	Naga Windows Workstation.....206	ZDS Z-Station 466Xh Model 200.....246
Contrade 486 EISA Dream Machine.....183	National Microsystems Flash 486DX2-66E.....208	Zeos 486DX2-66.....246
Dell 466DE/2.....184	NCR System 3350.....208	
DFI 486-66DX2.....184		
Diamond DX2-66.....189		
Digital DECpc 466d2 LP.....189		

Editors' Choice.....114

Price/Performance Index.....128

Performance Tests.....136

Summary of Features.....156

Networking

Network Printing: Sharing the Wealth

BY FRANK J. DERFLER, JR., AND DAVID GREENFIELD Sharing expensive laser printers to cut down on costs is a natural opportunity for networks. Products for NetWare networks come in several varieties: software packages, external devices that attach to a network cable, and internal cards that fit into a PC or an HP LaserJet. PC Labs tests 18 print servers and tells you which are the fastest and most functional.....249

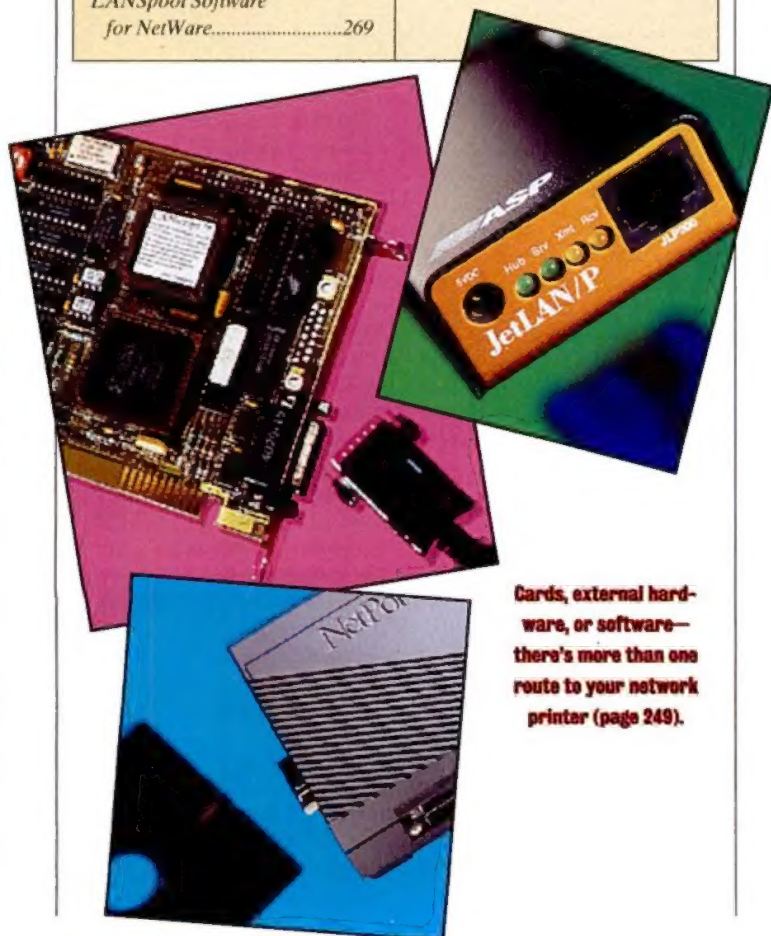
Central Station.....252	NetPort II Print Server.....269
JetLAN.....255	LANscript.....270
JetLAN/P.....255	PSERVER.NLM.....270
Mosaic.....257	PrintQ LAN.....272
PS-Print.....265	Network Assistant Plus
JetPress.....266	VAP/NLM.....273
LANpress.....266	Highlights.....250
LANsprint.....266	Editors' Choice.....251
ExtendNet 2856.....268	Summary of Features.....254
Pocket Printer Server.....268	Performance Tests.....258
Printer Assist.....268	Solving Network Printing
HP JetDirect Card for	Problems.....264
Ethernet.....268	
LANSpool Software	
for NetWare.....269	

Applications Development

Nonprogrammable Databases: Power Without Pain

BY SHERYL CANTER AND JOE SALEMI Ease of use does not have to mean lack of power. PC Magazine evaluates ten nonprogrammable database systems that let you use menus and your mouse to design custom database applications of surprising complexity275

AceFile for Windows.....278	Q&A.....308
Alpha Four.....284	Ultra-Plus.....310
Approach for Windows.....286	
DataEase Express	Suitability to Task.....276
for Windows.....290	Editors' Choice.....277
FileMaker Pro for Windows.....292	Survey: A Database with
PC-File.....293	Statistics.....278
PrimaBase.....294	Performance Tests.....282
PRO-dVelBase.....303	Summary of Features.....300



Cards, external hardware, or software—there's more than one route to your network printer (page 249).



The latest crop of nonprogrammable database systems make it easier than ever to create powerful and attractive applications (page 275).

TECHNICAL COLUMNS

User-to-User

PC MAGNET BY NEIL J. RUBENKING Find the length of a string using a batch file; a simple utility that hides the date and time stamp; find out how much free space you have on your hard disk.....316

Tutor

BY JEFF PROSISE A Look Inside Windows Icons, Part 1318

Lab Notes

BY WINN L. ROSCH PCMCIA: The Expansion System of the Future321

Utilities

PC MAGNET BY DOUGLAS BOLING Bring Variety to Your Windows Desktop with CHANGER327

Environments

PC MAGNET BY CHARLES PETZOLD Working with OS/2 Bitmapped Fonts333

Power Programming

PC MAGNET BY RAY DUNCAN Exploring Windows System Registry Performance Data339

Solutions

Peripherals: A strategy for troubleshooting communications problems.....357

Operating Environments: Give the Windows File Manager drag-and-drop editing358

Word Processing: A short macro that centers multiple lines of text in WordPerfect 5.1; the pros and cons of using exact line spacing in WinWord.....366

Spreadsheets: Cycle through all the graphs in your 1-2-3 spreadsheet with a macro-writing macro; how @IF treats labels in Quattro Pro.....374

Databases: A better way to choose colors for your FoxPro applications.....384

Graphics: Predict PostScript problems and solve them before you start to print392

Networking: An easier way to check NetWare's RPRINTER remote print server; more insight on using public phones equipped with modem jacks392

Languages: Constructing objects for Turbo Pascal programs using only a pointer to the VMT and a pointer to the constructor399

AFTER WORDS

After Hours

Flying

- Falcon 3.0 and Operation: Fighting Tiger468
- Flying Fortress469
- Aces of the Pacific469
- Rudder Control System469
- Aircraft and Adventure Factory470

Abort, Retry, Fail?

BY ROBIN RASKIN472

ALSO IN THIS ISSUE

PC Direct	347
Marketplace Index	439
Premier	439
Classified	439
Business Card	458
Reader Service Card	455
Index to Advertisers	463
Advertisers' Product Index	466
Coming Up	466
Editorial Product Index	467



Who needs a plane? With these sophisticated flight simulators, you never have to leave your PC (page 468).



When worlds collide, something bad is bound to happen (page 472).

Feel The Information.

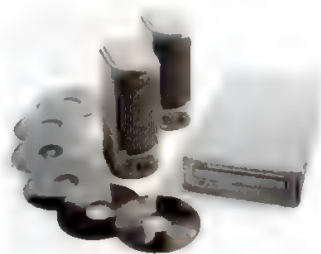
It's all around you. See it, hear it, watch it move, all at the same time. With the Desktop Library, a complete CD-ROM multimedia kit for your PC.

It's a learning tool that lets you hear the music as you read about the composer, witness historic events in video clips and stereo sound, and explore some of the great wonders of the world.

It's also a valuable business tool, giving you access to thousands of CD-ROM titles, from census data to medical journals.

A complete Desktop Library kit comes with CD-ROM player, stereo speakers, sound board, and a collection of utilities, applications, and multimedia titles on six CD-ROM discs.

Everything you need to turn information into an experience. Call 1-800-352-7669, ext. 100.



Sony Desktop Library



SONY®



©1992 Sony Corporation of America. All rights reserved. Sony and Desktop Library are trademarks of Sony. Complete external drive Desktop Library kit featured.

CIRCLE 071 ON READER SERVICE CARD



Editor-in-Chief Michael J. Miller

Editor Joel Dreyfuss

Executive Editors Bill Howard, Robin Raskin

Director, PC Labs C. James Galley III Art Director David Herbick

Senior Networking Editor Frank J. Derfler, Jr.

Senior Editors Christopher Barr (West Coast), Trudy Neuhaus (Technical Columns), Don Willmott (First Looks)

Managing Editor Paul B. Ross

Assistant Managing Editor Dianne H. McDonald

Manager, Copy Edit Karen A. Carter Associate Editors Sheryl Canter (Applications Development), Julie Cohen (After Hours), Mary Kathleen Flynn (Trends), David Greenfield (Networking and Communications), Lori Grunin (Graphics), Brian Nadel (PCs), Ted Stevenson (Software), Sharon Terdeman (Technical Columns), Jennifer Zaino (Hardware) Technical Editor Neil J. Rubenking Copy Chief Glen Boisseau Becker Staff Editors Michael Cohn, Gayle C. Ehrenman, Angela Gunn, Catherine Kunkemueller, Carol Levin, Michael W. Muchmore, Ann Ovodow, Craig L. Stark, Lance N. Ulanoff Staff Writer Oliver Rist Copy Editors Jeanne Albrecht, Robin B. Bornstein, Jamie M. Bsales, Kimberly Lee, Jill Léger, Bob Sillery Assistant Copy Editor N. Jeanne Smith Assistant Editors Shari L. Girouard, Ellyn McCasland, Kim Schueler, Emerson A. Torgan Layout Manager Linda Harms Assistant Layout Manager Shelly Fierston Senior Layout Editors Thomas DeVito, Lillian Gaffney Layout Editor Michael L. Graham Librarian Thomas W. Giebel Library Assistant Dolores Williams Editorial Researchers Daniel A. Begun, Camille N. Cline, Brad Grimes, Andrew C. Kantor, Susan G. Thomas, Anush Yegyzarian Editorial Assistant Tin Albano Editorial Trainees Adam A. Hicks, Brad Stilwell Business Manager Justine Casey Gaeta System Support Manager Craig Ellison PC Support Analyst Melvin Acevedo Production System Support Manager Pat Perkowski Communications Manager Allison Playford Assistant to the Editor-in-Chief Tara Caulfield Assistant to the Editor Rita Aprahamian Assistant to the Executive Editors Christina M. Evelyn Administrative Assistant Christina Okang Support Associate, PC MagNet Louise Laberge Sysop, PC MagNet Ken Hipple

Contributing Editors Bill Machrone (Publishing Director), Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones, Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prosser, Sal Ricciardi, Winn L. Rosch, Joe Salemi, Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Gus Venditto, Ethan Winer, William F. Zachmann

Associate Art Directors Heidi Antman, Charles Conover, Donna Panagakos, Lisa A. Sergi Assistant Graphics Director David Foster Graphic Artists Robin L. Malik, Josef Pusudu Assistant to the Art Director Frieda T. Smallwood

Technical Directors Rick Ayre (Software), Nick Stam (Hardware) Project Leaders Richard Brady (Networking and Communications), Ben Z. Gottesman (Software), Jonathan Hill (PCs), Jeff Mace (Graphics), Stephen W. Plain (Applications Development), Michael J. Zulich (Hardware) Sr. Programmer Stuart R. Greenberg Programmer Bradley G. Epranian Product Testing Manager Charles Rodriguez Tech. Analysts Mario Baldasserini, Jimmy Beltran, Richard Fisco, Margaret A. Piemonte, Amarendra Singh Support Technicians Thomas M. Amoroso, Paul Y. Chin, Laura Cox, William P. Flanagan, Constantine Fotopoulos, Dan Smith Operations Manager John R. Delaney Inventory Control Coordinators Peter Bastide, Rob Graydon, John Jones Administrative Assistant Angela M. Collins

Publisher Jeff Ballowe

Associate Publisher, West Coast Anna Zornosa Associate Publisher Daniel Rosensweig Advertising Director, East Coast Lon Otremba Marketing Director Ellen Atkinson Promotion Manager Stacy O'Connell Creative Services Manager John Wisdom Client Services Manager, Networking Michael Wiener Client Services Director Michael Perkowski Client Services Manager Bill Stephen Research Director Michael Van Engen Research Associate Theresa McKenty Special Projects Director Karla Spormann

Senior Advertising Production Manager Lori Iaccino Advertising Production Manager Pamela Berkowitz Assistant Advertising Production Managers Susan Conrad, Allen Grady Editorial Production Coordinators Kevin S. Fagan, Jo-Ann Hirschel

Advertising Offices: One Park Ave., New York, NY 10016; 800 33 MAG AD, 212-503-5100

Ziff-Davis Publishing Company

Chairman and CEO Eric Hippeau

President J. Scott Briggs

Executive Vice Presidents Ronni Sonnenberg, Mike Edelhart

Group Vice President J. Samuel Huey

Group Vice President, Direct Publications Jim Stafford

Senior Vice President, Marketing Paul H. Chook

Senior Vice President Rachel Greenfield

Senior Vice President, International Development J.B. Holston III

Vice President & General Manager Louis B. Dotti, Jr.

Vice Presidents Baird Davis (Operations), Howard D. Skolnik (Controller), Herbert Stern (Creative Services), Marian O. White (Research), Bert Lacy (Circulation), James F. Ramaley (Circulation Services), Ann Pollak Adelman (Marketing Services), Roger Herrmann (Production), Alan Power (Asia-Pacific), Frank Kelcz (Europe), William B. Machrone (Technology), Paul Stafford (Central Advertising Sales), Rayna Brown (Human Resources), William L. Phillips, Claude P. Sheer Executive Director, Information Systems John Helliwell National Managing Director, Magazine Networks Joseph Gillespie Directors Jean Lamensdorf (Licensing), Gary A. Gustafson (Planning), Walter J. Terlecki (Production), Dan Leonetti (Sales Training), Susan Delman (Corporate Marketing), Lewis D'Vorkin (Editorial Director), Alicia Marie Ivans (Direct Marketing Programs), Gregory M. Jarboe (Public Relations), Business Manager, Publishing Operations Tom McGrade

Ziff Communications Company

Chairman William B. Ziff, Jr.

President Philip B. Korsant

Executive Vice Presidents Philip Sine, E. C. "Mick" Prokopis

Senior Vice President Hugh Tietjen

Vice President, General Counsel, and Secretary J. Malcolm Morris

Vice President, Controller, and Treasurer Patrick J. Burke, Jr.

Vice President, Human Resources Frederick K. Staudmyer

Vice Presidents Seth R. Alpert, Steven C. Feinman

Vice President, Business Manager T.L. Thompson

Vice President, Chief Information Officer Thor Olson

Vice President, Electronic Editorial Director Michael Kolowich

Vice President of Market Development Robert G. Brown

Subscription Inquiries, Address Changes

Subscription Services: For subscription service questions, address changes, or ordering information, call toll-free 800-289-0429 in the U.S. and Canada; all other countries, please contact Ireland: 353-61411466 or fax 353-61419457. Or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rates: The subscription rate is \$44.97 for a one-year subscription (22 issues). Canada and all other countries, please add an additional \$32.00 for postage. GST Registration Number: R-123669673.

Back Issues: For back issues (subject to availability), \$8 per issue (\$9 outside the U.S.), send check or money order to Back Issues Dept., Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

How to Contact the Editors

We welcome letters. However, we cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. Send your written questions, complaints, and compliments to *PC Magazine*, One Park Avenue, New York, N.Y. 10016. Please include a daytime telephone number. Send electronic mail to MCI Mailbox 157-9301 or to PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500.

If you are dissatisfied with a product advertised in *PC Magazine* and cannot resolve the problem with the vendor, write (do not call) Julie Eigo, Advertising Department at the above address. Include copies of your correspondence with the vendor.

PC Magazine does not accept unsolicited manuscripts. We will pay \$50 for Solutions and Programming user tips and for Abort, Retry, Fail? submissions. If you submit artwork or newspaper clippings with Abort, Retry, Fail?, mark up the photocopy, not the original.

PC MagNet

PC Magazine operates PC MagNet, an on-line service of ZiffNet, hosted by CompuServe. To join, set your communications software for 300, 1,200, 2,400, or 9,600 bits per second (bps), 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, dial 800-635-6225, voice only.) When the modem connects, press Enter. At the Host Name prompt, enter PHONES. Follow the menus, note the number closest to you, then hang up and dial the number you have just found.

To obtain the utility without ZiffNet connect charges, at the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 60116.1. At the PASSWORD prompt, enter PCMAGUTIL. To join ZiffNet, at the Host Name prompt, enter CIS. At the USER ID prompt, enter 177000.5000. Enter PC*MAGNET at the PASSWORD prompt and Z11D9200 at the ENTER AGREEMENT NUMBER prompt. CompuServe members may join by typing GO PCMAG at any CIS prompt. For Customer Service, call 800-848-8990. ZiffNet membership is \$2.50 a month, which includes access to *PC Magazine* Editors' Choice Awards, Product Reviews Index, weekly news from *PC Week*, Buyers' Market, and ZiffNet Highlights and Information. Hourly connect charges are \$6.30 for 300 bps, \$12.80 for 1,200 or 2,400 bps, or \$22.80 for 9,600 bps.

Permissions, Reprints

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Claudia Crichlow.

PC Magazine Reviews

Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25e's.

Editorial and Business Office: One Park Ave., New York, NY 10016. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered trademark of International Business Machines Corp. Entire contents copyright ©1993 Ziff-Davis Publishing Company, a division of Ziff Communications Company. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are registered trademarks of Ziff Communications Company: PC, *PC Magazine*, PC Labs, PC MagNet, PC Magazine Award for Technical Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Communications Company: Abort, Retry, Fail?; Connectivity; Databases; Direct Marketing Connection; First Looks; New and Improved; Advisor; Lab Notes; PC Marketplace; Pipeline; Trends; Tutor; The PC Utilities; Power Programming; Power User; Read Only; Spreadsheets; User-to-User; The Working Word.





Here's Why Austin's Soaring.

Austin makes great machines at great prices, but that's not the only reason we're an industry leader.

Here's eight more reasons we're soaring above the competition:

1. AWARD-WINNING MACHINES.

Five PC Magazine Editor's Choice Awards in three years! These awards are sought after by every PC maker and are the buyer's standard for technical excellence and value.



2. WE'VE PROVEN OURSELVES, OVER AND OVER, FOR OVER 8 YEARS.

While others come and go, Austin's been in business for eight profitable years — with a 75% customer repeat-purchase rate.

3. COMPLETE NETWORK SUPPORT.

As a Novell "Gold Authorized" Reseller, we provide turn-key network solutions anywhere in the U.S. — and unbeatable value. Consultation is free, NetWare installation is free, and the first 30 days of NetWare support is free.



4. QUALITY ASSURED!

Each Austin system is built to order, by an individual who is responsible for, and compensated according to customer satisfaction with the system. In addition, Austin is the only manufacturer that burns in 100% of your system (hardware and software) and tests each component for compatibility.



5. YOUR SYSTEM ARRIVES READY TO RUN.

All you do is plug it in. We configure the system, format the hard drive and install your software.



Software disks and manuals included, too!

6. OUTSTANDING CUSTOMER SERVICE AND SUPPORT, 24-HOURS-A-DAY.

24-hour toll-free technical support hotline. On-line bulletin board service.

And every Austin support person is specially trained to answer any questions you have.



7. WE STAND BEHIND OUR SYSTEMS.

We offer a 30-day, money-back

guarantee, and free, one-year on-site service from GE™ in the U.S. (Memorex Telex service in Canada) on systems. We also offer extended warranties on both parts and labor.



8. TOP-NOTCH COMPONENTS.

Austin uses the latest technology to produce the most cost-effective, state-of-the-art systems that include top-notch components like VESA local bus video and local bus drive controllers. Intel architecture and standardized components keep your options open for upgrades and lower your cost of service.



1(800) 752-1577

24 HOURS A DAY

AUSTIN

Compare Dell.



Dell 325N
\$2149
WITHOUT FAX MODEM



\$1999

WITH FAX
MODEM

Long-life 12-cell battery gives
true 4-hour performance;
latching mechanism prevents
loss of battery contact.

No Comparison.

Notebook Features	Austin 386/SXL25	Dell 325N
Memory	4MB	4MB
Hard Drive	60MB (120MB Capacity*)	60MB
Built-In Track Ball	Yes	No
S/R Fax Modem (9600B Fax/2400B Data)	Yes	No
Battery Life	4 Hours	3.5 Hours
Tech Support	24 Hours/Day	14 Hours/Day
Money-Back Guarantee	60 Days	30 Days
Microsoft DOS 5.0	Yes	Yes
Microsoft Windows 3.1	Yes	No
PFS Window Works, Contact Manager Software	Yes	No
McAfee Anti-Virus Software	Yes	No
Carrying Case, AC Adapter	Yes	Yes
PRICE	\$1999	\$2149

**60-DAY
NO RISK
GUARANTEE!**

Twice the time
to judge Austin's
quality and reliability
for yourself!

1(800) 545-6037
24 HOURS A DAY

Dell® is a registered trademark of Dell Computer Corporation.

Notebook comparisons conducted in December, 1992. Current prices and configurations may vary.

*Achieved with free SuperStor data compression software. 120MB Hard Drive is also available.

240MB capacity with SuperStor.

A U S

"Most bang for the buck..."

Attractive, aggressive and affordable." - PC Magazine

ALL SYSTEMS

INCLUDE

THE FOLLOWING UNLESS NOTED

- 1.44MB & 1.2MB Floppy Drives
- 101-Key Keyboard, Microsoft Mouse
- Pre-Installed MS DOS 5.0 & Windows 3.1
- McAfee Anti-Virus Software
- Small Footprint Chassis

486/SX-25 WinStation \$1799

- Intel i486SX running at 25 MHz w/ 128K Cache
- 4MB RAM (to 32MB)
- 170MB Hard Drive
- 14" VGA 1024x768 Non-Interlaced Monitor
- Windows Acc. Video Card
- UPGRADABLE

486/DX2-50 VESA-LB WinStation \$2499

- Intel i486DX2 running at 50MHz w/ 128K Cache
- 4MB RAM (to 32MB)
- 210MB Hard Drive
- 14" VGA 1024x768 Non-Interlaced Monitor
- VESA Local Bus Video Card
- One Additional VESA Expansion Slot
- UPGRADABLE

486/DX2-66 VESA-LB WinStation \$2999

- Intel i486DX2 running at 66MHz w/ 128K Cache
- 4MB RAM (to 32MB)
- 330MB Hard Drive
- 15" VGA 1024x768 Non-Interlaced Monitor
- VESA Local Bus Video Card
- One Additional VESA Expansion Slot

486/33 WinStation \$2199

- Intel i486 running at 33 MHz w/ 128K Cache
- 4MB RAM (to 32MB)
- 210MB Hard Drive
- 14" VGA 1024x768 Non-Interlaced Monitor
- Windows Accelerator Video Card
- UPGRADABLE

486/50 WinStation \$2599

- Intel i486 running at 50MHz w/ 128K Cache
- 4MB RAM (to 32MB)
- 210MB Hard Drive
- 14" VGA 1024x768 Non-Interlaced Monitor
- Windows Accelerator Video Card

486/DX2-66 EISA WinTower \$3599

- Intel i486DX2 running at 66MHz w/ 128K Cache
- 8MB RAM (to 128MB)
- 330MB SCSI Hard Drive, EISA SCSI Controller
- 14" VGA Monochrome Monitor
- Tower Chassis

486/SLC-25 NetStation \$999

- Cyrix 486SLC running at 25MHz
- 1MB RAM (to 16MB)
- Choice of 1.44MB or 1.2MB Floppy Drive
- 14" VGA Color Monitor
- 16-Bit Austin Combo Ethernet Adapter

DOS Windows Mouse not included

486/DX2-66 EISA SuperServer \$9999

- Intel i486DX2 running at 66MHz w/ 128K Cache
- 16MB RAM (to 128MB)
- RAID 5 EISA Controller w/ 2.4GB Drive Array
- 32-Bit Austin Combo EISA Ethernet Adapter
- 14" VGA Monochrome Monitor
- Tower Chassis

386/SXL-25 Notebook \$1899

- AMD 386SXL running at 25MHz
- 4MB RAM (to 8MB)
- 60MB Hard Drive (120MB Available)
- SuperStor Data Compression Software
- 640x480 Display w/ 32 Gray Scale
- 1.44MB Floppy Drive
- Built-In Track Ball
- 79-Key Keyboard w/Inverted-T Cursor Keys
- PWS WindowWorks and Contact Manager
- Carrying Case w/Accessory Pocket

Austin Networks!



As a Novell "Gold Authorized" Reseller, Austin provides turn-key networks anywhere in the country. Ask about our free NetWare installation and configuration.

Austin is also a Novell Labs

Self-Certification & Testing Center. We can certify virtually any configuration of file server or workstation.

For more information on our many network services, contact:

1-800-874-7182
NETWORK DIVISION

AUSTIN
COMPUTER SYSTEMS
10300 Metric Blvd., Austin, TX 78758

FAX 1-512-454-1357
Canada 1-800-338-1565
Overseas 1-512-339-3500
Government 1 (800) 833-4472
GSA #G500K91 AGS-5201-P501
Corporate 1-800-622-5506

1-800-752-1577
24 HOURS A DAY

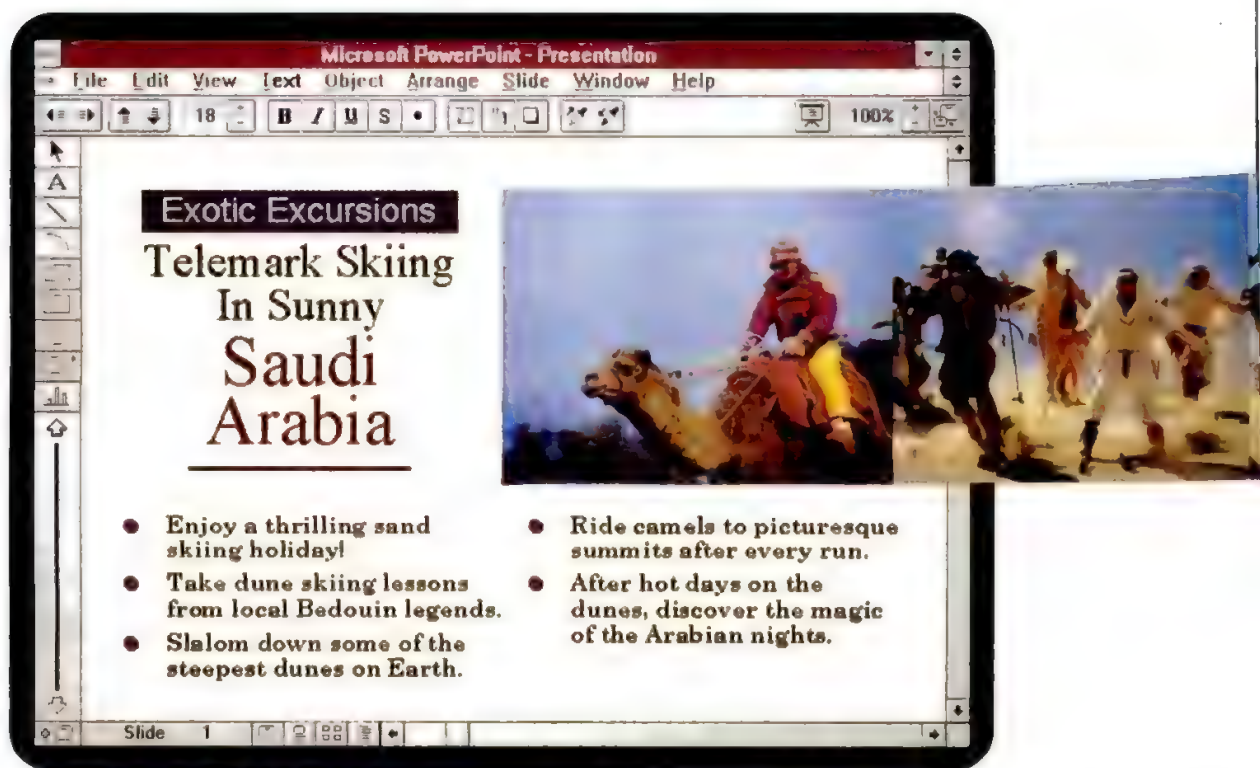
We accept ACS
and all major
credit cards
-and C.O.D.

CALL FOR
OUR LATEST
TELEPHONE
SPECIALS!

CIRCLE 012 ON READER SERVICE CARD

Introducing Microsoft

The difference between present



Add a new dimension of visual impact to all your business communications with Microsoft® Video for Windows.™ It's the easy way to take your Windows-based word processing documents, spreadsheets, and presentations and put them into action. In fact, you can incorporate digital video clips into any OLE-aware application for a more complete and engaging message.

To start with, you can choose from over 240 different clips in the video library* that's included standard on a CD-ROM disc. Or you can easily create your own digital video

sequences with our VidCap tool and a video capture board like the low-cost Video Blaster™ from Creative Labs. Simply use video footage



you've shot with your own camcorder. Or incorporate existing video clips from your company's library for product demonstrations and customer presentations.

With Microsoft Video for Windows, editing is easy, too. Just call up the VidEdit tool. Click your selection on the toolbar. And you're well on your way to assembling video sequences that show off your unique directorial style.

To run new Video for Windows, all you

© 1992 Microsoft Corporation. All rights reserved. Printed in the U.S.A. *Portions provided by FirstLight, Inc.™ Plus applicable sales tax. Reseller prices may vary. Offer good until March 30, 1993. Please allow 2-4 weeks for delivery upon receipt of this order by Microsoft. In the 50 United States, call (800) 882-2000, Ext. JA3. For information only, in Canada call (800) 563-9048; outside the 50 United States and Canada, call (206) 936-8661. Trial Pack system requirements: Personal computer with 386SX or higher microprocessor running

ft Video for Windows. ing the facts and telling the story.



With the Media Player, you can easily view video clips or incorporate them into any OLE-aware application.

higher PC with no extra hardware. And, since Intel® Indeo™ technology is built in, you can add special video hardware (which supports this technology) for enhanced video quality.



For a preview of Video for Windows, order our Trial Pack for just \$9.95.* It contains everything you'll need to see how Video for Windows can impact your communications

need is the Microsoft Windows operating system and a 386 or

Or see the entire performance by getting your own copy of Video for Windows. We think you'll get the picture. And so will your audience.

Experience Video for Windows on your own PC.

You can order the Video for Windows Trial Pack directly from Microsoft for just \$9.95. Or you can get a copy of the full product from an authorized reseller near you.

To place your Trial Pack order or to get the name of a reseller in your area, call Microsoft today at (800) 882-2000, Ext. JA3.

Microsoft®
Making it easier

Microsoft Windows operating system version 3.1, audio board compatible with Windows, VGA display (256 color or greater recommended). Microsoft mouse or compatible pointing device and a 3.5-inch high density (1.44 MB disk drive) are required. Microsoft is a registered trademark and Windows is a trademark of the Microsoft Corporation. Intel is a registered trademark and Indeo and the Indeo logo are trademarks of Intel Corporation. Video Blaster and the Video Blaster logo are trademarks of Creative Labs.

According to Mr. Magoo, there's no trick to spotting a reliable monitor. You just pick one from a manufacturer that has met the stringent ISO 9000 series of standards for quality. And displays the ISO 9000 seal. The way Samtron does.

In fact, Samtron was awarded ISO's highest rating: ISO 9001. One of the very few monitor manufacturers in the world to ever earn it.

To achieve that rating, we underwent 1½ grueling years of auditing ordered by the Geneva-based International Organization for Standards (ISO). Everything we do was scrutinized. From design and manufacturing through packing and shipping.

Their high rating means that, with the possible exception of advertising, they approve of what Samtron does. The way we train our people. The way we keep our records. Our management. Our delivery. Our overall product quality. About the only thing they weren't quite sure of was Magoo.

Gads, Two New Flat-Screen Monitors.

With our world-class ISO credentials clutched in hand, we present our new high resolution flat-screen, color monitors. The SC-528DX multi-mode 15". And the SC-726V, our 17" with 0.26 dot pitch. These monitors have pictures so big and so sharp that even Mr. Magoo's eyes can see them. All the way out to the corners. Without distortion. Which makes them ideal for viewing Windows™ or CAD/CAM. If your needs are smaller look at our

14" EagleEye™ color monitor SC-428TX. With 0.28 dot pitch and 1024 x 768 non-interlaced resolution.

They're all monitors worth looking into.

Even Mr. Magoo can see that.

Now, Even Reliability Is Easy To See



Model SC-726V 17" Flat Screen
0.26 dot pitch, 1024 x 768 non-interlaced resolution
Full screen, 1024 x 768 non-interlaced resolution
Full screen, 1024 x 768 non-interlaced resolution
Full screen, 1024 x 768 non-interlaced resolution

Along with our ISO 9001 rating, Samtron's entire line of monitors gets the Mr. Magoo approval. It's the only monitor technology that the rest



WE'RE WORTH WATCHING

SAMTRON

Samtron 14251 E. Firestone Blvd., Suite 101, La Mesa, CA 92040. Phone: (619) 444-1111. Mr. Magoo: (619) 444-1111. Fax: (619) 444-1112. E-mail: magoo@samtron.com

CIRCLE 296 ON READER SERVICE CARD

Letters

IN PURSUIT OF FAIRNESS:

WINDOWS VS. OS/2

The Windows-OS/2 comparison, "Will the New Standard Please Stand Up?" (November 10, 1992) reflected the way you would feel if you were very familiar with Windows, but were not familiar with OS/2. Take somebody who's used PCs for ten years and sit him or her down in front of a Macintosh, with instructions to spend an hour—or a week—giving it a try. Do the same with a Macintosh user in front of a PC. Each user will think the unfamiliar approach is no good. All the habits, instincts, and preferences users have developed using one system do not immediately transfer to the other.

I assume the person who wrote the section about OS/2 had actually used that operating system, but the presentation as a whole reads as if written by individuals familiar with only one of the two systems the article purported to compare.

*James Fallows
Washington, D.C.*

I found the introduction to the Windows versus OS/2 story to be mostly fair. I found the test results unsurprising (though I do not agree subjectively with them), and I was gratified by the caveats in the Windows article as well as by the positive comments in the one about OS/2.

Where I perceive bias is not so much in what the articles say as in their placement and the type of comments highlighted in them; for example, the placement of the NT sidebar smack in the middle of the OS/2 review. This suggests to me that *PC Magazine* was trying to mitigate the effect of positive OS/2 comments by inserting a highlighted tout for NT "and Beyond" (as if there would be no future for OS/2).

*David Brinner
Fults, Illinois*

In the introduction to the Windows versus OS/2 story, you say that "video resolution under Windows is currently limited to VGA." This is false.

Windows is available under OS/2 at any resolution supported by OS/2. I am currently running OS/2, including my



***"Your tests could be biased
by the quality of Windows
and OS/2 applications."***

Windows sessions, at 1,024-by-768 resolution with 256 colors, without any significant problems. The restriction that does exist, however, is that on most video adapters, Windows under OS/2 must be run as a full-screen in high-resolution video mode, just as it must in high (and low) resolution under DOS.

*H. Steven Durrett
Menlo Park, California*

You often compare Windows and OS/2 doing different things but fail to point out that the tasks are different.

"Program Load" in OS/2 involves setting up a separate and protected VDM, loading Windows in it, and then loading the applications. Yes, this does take longer than loading the program into Windows already running on DOS, but if your readers don't realize that this time differential is the price paid for protected, separate VDMs, they'll just think one system is less efficient than the other.

You have a choice between optimizing for data integrity or for speed. In your test for speed, you sacrificed speed for data integrity! If you're comparing speed, you should optimize each system for speed.

*Charles Dort
Staunton, Virginia*

Are you comparing applications, or OS/2 2.0 to Windows? It's both important and ethical for you to point out to your readers that your tests could be biased by the quality of the Windows and OS/2 applications themselves. What does analyzing a 16-bit OS/2 version of Microsoft Excel that does not even take advantage of OS/2 features, say about OS/2 2.0? Excel for OS/2 is a single-threaded port of the Windows version.

If you had said the Excel product for Windows is far superior to the OS/2 version I would have agreed with you wholeheartedly. Instead you state that Windows is superior to OS/2 2.0 because of this.

*Michael Wade
Blacksburg, Virginia*

In your performance tests, you don't specify if OS/2 was using HPFS or FAT, nor do you specify whether any optimization of the OS/2 or Windows cache was done. The use of HPFS will dramatically speed small file management, but of course you didn't test performance with small files.

Also, you measure DOS single application performance, but don't do the far more interesting measure, namely DOS multitasking.

By contrast, your multitasking measure refers to multitasking Windows applications. This is preposterous. If you were serious you'd multitask DOS, Windows, and OS/2 applications.

*John Faughnan, M.D.
Escanaba, Michigan*

• **There was one factual error and one omission in "Will the New Standard Please Stand Up?":** H. Steven Durrett is correct that Windows can be run at high resolution in full-screen mode. We also neglected to say that HPFS was used during our testing of OS/2.

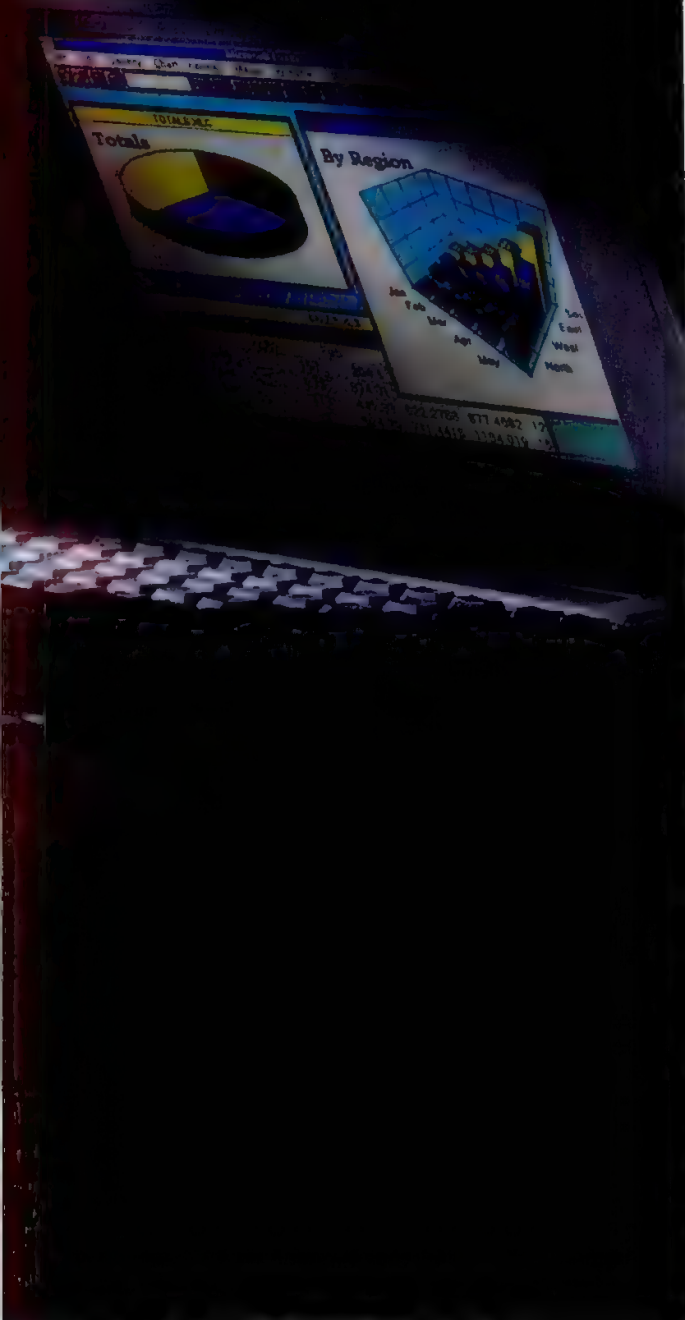
Operating systems are complicated to test; we're confident that our testing sheds new light on many pertinent issues. We've listened to the suggestions and comments of our readers and we can assure you that this was not our "first look," nor will it be our last.—Ed.

THEY MAJORED IN ENGINEERING WITH A MINOR

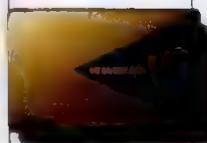


INTRODUCING THE TOSHIBA SATELLITE

OR IN ECONOMICS.



LLITE SERIES



The T1850C and T1850 can be expanded to 12MB of RAM, and the T1800 can go to 10MB.



The Satellite series features our MaxTime™ power management system that gets the maximum out of every battery charge.



You can call real live Toshiba technicians toll-free for complete product support.



With the introduction of our new Satellite™ series of computers, we gave our engineers an extremely challenging test.

Namely, to design a line of portables loaded with Toshiba's legendary technology and engineering, for a price you'd expect to pay for a common clone.

In our humble opinion, they passed.

With flying color.

Because our engineers gave the Satellite T1850C quite simply the best color STN screen available. Period. At any price. Along with a 25MHz 386SX processor, 4MB RAM expandable to 12MB and an 80 or 120MB hard drive.

They also packed the same 25MHz 386SX processor, RAM and hard drive options into our T1850 LCD model. And gave our most modestly priced model, the T1800, a not-so-modest 20MHz 386SX, 2 to 10 MB of RAM and a 60MB hard drive.

But it isn't just amazing specs like these that make the Satellite series the class of its class. All three models also have the same revolutionary innovations you find in every Toshiba. Including our MaxTime™ power management features like AutoResume and AutoSave. Password control for security. And a keyboard with standard size keys and key spacing for the feel of a desktop.

Now, one more thing we'd like to point out: the phone number under our logo.

Call it, and we'll give you more information, including the location of the nearest Toshiba dealer.

Where you'll be able to see for yourself that with prices this minor, our Satellite series really is a major breakthrough.

In Touch with Tomorrow

TOSHIBA

1 - 8 0 0 - 4 5 7 - 7 7 7 7

CIRCLE 379 ON READER SERVICE CARD

© 1992 Toshiba America Information Systems, Inc. The Intel Inside logo is a trademark of Intel Corporation. All products indicated by trademark symbols are trademarked and/or registered by their respective manufacturers.

LETTERS

FONTASTIC PART II

After reading your very well written article, "Typecasting: Choosing and Using Fonts" (October 27, 1992), I found that while you do make a few very good recommendations, there are a couple that I feel may not be so advantageous.

For a slight increase in speed, you suggest using screen bitmap fonts (*.FON) along with the TrueType versions of the same fonts. Unfortunately there are several problems with Windows 3.1 using screen bitmap fonts when there is more than one style in each family. Windows will be unable to reliably choose the proper screen bitmap fonts for styles within a family.

Another recommendation you make is to not delete the Symbol screen bitmap font. This can be problematic because the Symbol screen bitmap font that comes bundled with Windows does not match the TrueType Symbol font.

Mike Evans
Long Beach, California

MICR, NOT OCR!

John C. Dvorak derailed himself with his reference to "the crazy little OCR letters at the bottom of a check" (Inside Track, November 10, 1992).

The OCR letters he refers to are in fact MICR characters (not letters), technically known as Type E-13B font. They are imprinted on checks for high-speed processing on Magnetic Ink Character Recognition Reader Sorters in most major banks.

Frank W. Sulick, Jr.
Valrico, Florida

32-BIT BLUNDER

I read with interest your recent article "R:BASE 4.0: The First 32-bit Database for DOS" (First Looks, September 29, 1992). There is, however, one point that I feel should be clarified.

You incorrectly stated that R:BASE 4.0 was the first 32-bit database for DOS, when in fact Fox Software (now merged with Microsoft Corp.) actually released the first 32-bit database, FoxBASE+/386, in 1987. Since then, Fox has released an extended version of FoxPro 2.0, also a 32-

bit database, and Microsoft is currently working on upgraded versions, FoxPro 2.5 for Windows and DOS.

Nevet Basker
FoxPro Product Manager
Microsoft Corp.
Redmond, Washington

CONTENT, NOT FORM = SPEED AND ADAPTABILITY

Your article "DOS Lives!" and Michael Miller's column, "The Good Word" (October 13, 1992), were both right on. For most applications, speed and adaptability are indeed much more important than graphical interfaces and arcane features. The best way to get more done is to do it quickly, and do it your own way. A computer, like any tool, shouldn't slow

you down or make you work in strange ways. A word processor, for example, should let you write instantaneously, like pen on paper. Instead, most word processors sacrifice speed and adaptability for bright lights and glitter.

Leo Nikora
Seattle, Washington

A CIGAR IS A CIGAR

Would someone please give me a break! Enough about Lotus and its "look-and-feel lawsuits" (Pipeline, October 13, 1992). Sure, Lotus pioneered the spreadsheet community, but as far as *look* is concerned, a menu is a menu. As for *feel*, well, a keyboard is a keyboard.

Craig Hoyles
Hilliard, Ohio

CORRECTIONS AND AMPLIFICATIONS

A photograph that was placed in the First Looks evaluation of the ALL SX 486/25 upgrade add-in (December 8, 1992) was incorrect. The photograph that *PC Magazine* printed shows the Arco Electronics AC-1079MC hard disk card.

The last sentence on page 233 of "Will the New Standard Please Stand Up?" (November 10, 1992) was incomplete. It should have read: "A patch was also necessary to allow OS/2 to install on an RLL/MFM hard disk." On page 240, the last sentence in the first column was also incomplete. It should have read: "Only when a post-1990 I/O card was installed in the machine would OS/2 print. The last sentence in the second column was also incomplete. It should have read, "DOS telecommunications programs may have difficulty recognizing serial ports above COM2, or uploading and downloading in the background on any port." Also, pages 238 and 239 are not missing; they were accidentally mis-numbered.

In "DOS Lives" (October 13, 1992), we incorrectly identified a product as System Sleuth for Windows. The correct name is WinSleuth, while the related DOS product is called System Sleuth.

Three of the type samples in "The Best of the New Type 1 Fonts" table in "Typecasting: Choosing and Using Fonts" (October 27, 1992) are labeled incorrectly. The sample labeled as Adobe Systems Inc. should be labeled Bitstream Inc. The sample labeled Agfa Division, Miles Inc. should read Adobe Systems, and the sample labeled Bitstream Inc. should read Agfa Division, Miles Inc.

The chart of TrueType fonts in "Typecasting: Choosing and Using Fonts" (October 27, 1992) contained two errors in the Quality column. Casady & Greene Inc. should have been rated "Very good," and FontBank Inc. should have been rated "Good."

We incorrectly printed the wrong phone number for the Canon CJ10 (First Looks, September 15, 1992). The correct number is 516-488-6700.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet (see page 12 for access information). All letters become the property of *PC Magazine* and are subject to editing.

Cool, Quiet, Reliable Power.

STANDARD UNITS

These UL/CSA approved, fully-tested power supplies are the best basic units available.

STANDARD 200 XT	\$69
STANDARD 205 SLIM	\$89
STANDARD 220 BABY	\$89
STANDARD 220 AT/TOWER	\$89

ULTRA-QUIET UNITS

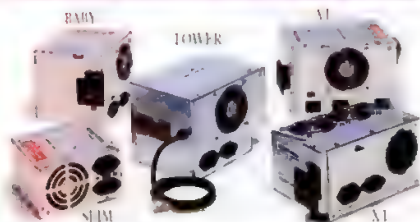
Unrattle your nerves with a Silencer power supply, recognized since 1986 as the industry's quietest. Cooled with efficient, variable-speed fans that are virtually inaudible!



A must for home office or multimedia applications.

SILENCER 205 SLIM	\$119
SILENCER 220 AT/TOWER	\$129
SILENCER 270 AT/TOWER	\$179

HIGH-PERFORMANCE UNITS



Upgrade your computer with one of our premium Turbo-Cool power supplies—the choice of PC professionals. You'll get 50% - 100% more power, built-in line conditioning, a dual-stage EMI filter, super-tight regulation, ultra-clean DC output, our high-capacity ThermoSense variable-speed fan (300W models), UL/CSA/TUV approvals, and a no-hassle 2-year warranty! Ideal for high-end workstations and network file servers.

TURBO-COOL 200 XT	\$159
TURBO-COOL 300 SLIM	\$169
TURBO-COOL 300 BABY	\$169
TURBO-COOL 300 AT/TOWER	\$189
TURBO-COOL 450 AT/TOWER	\$349

REDUNDANT POWER SYSTEM

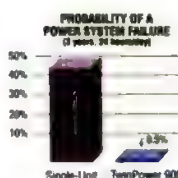
Eliminate the risk of costly downtime or data loss due to power supply failure with the TwinPower 900 Redundant Power System. The system consists of two Turbo-Cool 450 power supplies in parallel, utilizing a special power-management interface module. You'll have the reliability of complete power redundancy for the entire network server.



- **Super Server Power.** With 900 watts of peak power, the TwinPower 900 effortlessly runs any array of drives—without the need for sequencing.
- **100 Times More Reliable.**

Why gamble with a single-unit system? TwinPower's load-sharing, redundant design lets you take the power system for granted. It's the peace-of-mind a network manager needs!

- **Hot-Swap Capability.** In the unlikely event that one of its 450s should fail, an alarm sounds, and the other 450 sustains the server while the user simply swaps in a new unit. No downtime!
 - **Optional Enclosures.** We offer "monster" cases that hold TwinPower's two power supplies and the interface. The Standard Model (51 lbs.) holds 13 drives, while the all-steel Industrial Model (104 lbs.) allows dual systemboards and holds up to 16 drives. Now, that's expandability!
- | | |
|-------------------------|--------|
| TWIN-POWER 900 | \$995 |
| W/STANDARD CASE | \$1695 |
| W/INDUSTRIAL CASE | \$1995 |

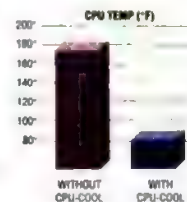


486 CPU COOLER



It's a fact that 486 chips run hot, often exceeding 185°F! Now, you can reduce the temperature of your 486 processor to a cool, safe 85° - 95°F with our CPU-Cool. You'll prevent random system errors and add years to the life of your valuable CPU. Consists of an ultra-quiet mini-fan embedded in a sculptured heat sink that easily mounts on the CPU. Powered by a spare drive connector. Effective, inexpensive insurance!

CPU-COOL \$39



INTERNAL ON-LINE UPS

Protect your PC and its data from power surges, sags, and outages with our UL-approved InnerSource, a combined AT/Tower power supply and On-Line UPS. Its



auto-recharge battery provides up to 15 minutes of backup power for both your PC and monitor. This reliable, integrated protection costs less than an equivalent 550VA external UPS, and it saves space too! A Novell interface is available.

INNERSOURCE AT/TOWER \$349

PC POWER & COOLING, INC.

5995 Avenida Encinas, Carlsbad, CA 92008 • (619) 931-5700 • (800) 722-6555 • Fax (619) 931-6988

Most orders shipped same day. We accept Visa, MC, COD, or PO on approved credit. Turbo-Cool and TwinPower models guaranteed for 2 years. All other products guaranteed for 1 year. Hours: 7 a.m. - 5 p.m. (PT) Mon. - Fri.

©1992 PC Power & Cooling, Inc. Silencer, Turbo-Cool, ThermoSense, TwinPower, CPU-Cool, and InnerSource are trademarks of PC Power & Cooling, Inc. All other brand names are trademarks or registered trademarks of their respective companies.

CIRCLE 080 ON READER SERVICE CARD



ZEOS® 486 EISA. Better Than Ever!

NEW FEATURES. LOWER PRICES!

PC Magazine called it "Outstanding." "...best on our tests." "...both surprisingly useable and affordable." Now we're calling it *better than ever*...and we know you'll agree!

It's the new, improved ZEOS 486 EISA. We've taken our powerful Editors' Choice EISA and added the features you've been craving: standard 256K cache, a monster 452MB SCSI hard drive, incredible upgradability, EISA SCSI caching controller for the fastest access to the info on your hard drive, flash BIOS, super VGA...plus a whole lot more. Everything you want for now...and need for tomorrow!

THE POWER OF EISA.

If you're running applications with heavy file access, you know to insist on EISA. And if you need a system that can grow with the territory, insist on a ZEOS.

Check out the specs on the right. The new ZEOS EISA's Zero Insertion Force (ZIF) upgrade socket makes upgrading your system easy. There's room enough to grow—all the way to the powerful performance of the 1993 OverDrive processor based on Intel's Pentium™ architecture. Plus, the six 32-bit EISA expansion slots will accept your 8-bit and 16-bit cards and run them without a hitch.

DETAILS MAKE THE DIFFERENCE.

With the ZEOS EISA, details make the difference. Like two cooling fans to help prolong the life of your system's components. A high-capacity power supply with built-in surge suppression. An easy-on-the-eyes non-interlaced SVGA color monitor. A Diamond SpeedStar 24X video card that offers over 16 million colors! A Microsoft Mouse, Windows and DOS. And that's not all.

"SUPERLATIVE SERVICE AND SUPPORT"

That's what PC Magazine calls ZEOS's 24-Hour-A-Day Toll-Free Sales and Technical Support program. We're here any time you need us—day or night.

And that's only the start of your ZEOS Customer Satisfaction Package. Add to it our 30-Day Absolute Satisfaction Money-Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy. You're going to be very satisfied. We don't just say it. We guarantee it!

ORDER YOUR ZEOS 486 EISA TODAY.

So give us a call right now. Choose from a pre-configured package or work with your own expert ZEOS Sales Consultant to tailor your new ZEOS EISA just the way you want it. Whatever you choose, two things are for certain. The ZEOS 486 EISA is now better than ever. And your satisfaction is guaranteed!

CALL NOW TOLL FREE

800-554-7172

MORE OPTIONS!

ZEOS has them all. Starting with blazing 32-bit EISA LAN cards, SCSI adapters and every other high-performance option you could possibly want. On-site service is available too. Call for details!

Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1992 ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company. (NASDAQ symbol: ZEOS). ES2P-PCM-9301B

486DX-33 \$3795
486DX2-50 \$3895
486DX2-66 \$3995

- Choice of upgradable CPU. Our Zero Insertion Force (ZIF) upgrade socket lets you go all the way to the 1993 OverDrive™ CPU based on Intel's Pentium™ architecture!
- 256K cache, standard.
- Six 32-bit EISA expansion slots also accept 8-bit and 16-bit cards.
- 8MB of high-speed RAM, expandable to a total of 64MB on the motherboard.
- EISA SCSI caching controller with 2MB cache expandable to 8MB.
- Ultra-fast 452MB SCSI hard drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- Diamond SpeedStar 24X VGA accelerator card/1MB RAM. Capable of over 16 million colors!
- ZEOS 14" 1024x768 non-interlaced SVGA color monitor, tilt-swivel base.
- Two serial and one parallel port integrated on the motherboard.
- Flash ROM for easy BIOS upgrades via disk or modem.
- High-capacity 200 watt power supply with built-in surge suppression.
- Rugged ZEOS vertical case with eight drive bays. Two cooling fans for increased component life and system expandability.
- ZEOS RS 101-key SpaceSaver keyboard.
- DOS, Windows, and a Microsoft Mouse.
- ZEOS 24-Hour-A-Day Toll-Free Technical Support, 30-Day Money-Back Guarantee, complete Customer Satisfaction Package.

**CALL NOW TOLL FREE
800-554-7172**

Fax Orders: 612-633-1325
Government: 800-245-2449
Hearing Impaired (TDD):
800-228-5389
MasterCard, VISA, Discover,
American Express, Z-Card,™
COD and Leasing Programs.
Open 24 Hours a Day,
365 Days a Year!



It's Amazing What NEC

- 30-day money-back guarantee
- Toll-free technical support
- Free FedEx® shipment within 72 hours
- Free one-year on-site service



Introducing NEC Select Solutions: A lot of extra bang for no extra bucks.

Why settle for an ordinary PC when, for the same price*, you can have an NEC Select Solution™ system? Every NEC Select Solution gives you the quality of an NEC system, the convenience of pre-loaded, optimized Microsoft® Windows™, and the performance of a world-renowned NEC MultiSync® monitor.

We've made Windows faster and easier than ever.

Through a strategic partnership with Microsoft Corporation, we've developed a method for optimizing Windows 3.1 that actually makes Windows computing not only easier but up to **20% faster** as well.



For example, the NEC custom Windows Program Manager (like the one at left) organizes the applications that work

together into logical groups. An Information Center group provides quick answers to your questions and includes ReadMe files for your system and your applications.

We also streamline your application parameter files by removing unnecessary drivers and filters. And all NEC Select Solutions include the Visual Basic™ library, allowing you to run any Microsoft Visual Basic program.

CALL
1-800-374-8000
For Latest Pricing!

NEC PowerMate® 425
NEC MultiSync® 3FGx™ Monitor
Pre-loaded Microsoft® Windows™ 3.1
486SX/25MHz, 8MB RAM, 120MB hard drive,
1.44MB floppy drive, 1MB video RAM (1024 x 768),
integrated fax/modem (2400/9600 bps), Norton Utilities,
Microsoft mouse, mousepad, 101-key keyboard,
DOS 5.0, remote "co-session" support

\$1,999



Will Sell You For Nothing

To maximize Windows 3.1 performance, we fine-tune many of its features: FastDisk is enabled; the system swap file is positioned for fastest access; memory interleaving is optimally sized; and your hard drive is fully optimized for maximum performance. It's Windows like you've never seen it before. And it's standard on every NEC Select Solution.

Outstanding performance from NEC monitors and CPUs.



Every one of our NEC Select Solutions includes an NEC MultiSync FG™ color monitor, widely recognized as the industry's best.

Our monitors would be great with any PC, but they perform even better with our PowerMate®, Image™, and Express™ series computers. NEC's unique ImageSync™ feature enables our PCs to adjust the display on a MultiSync monitor so that it operates at the maximum refresh rate. The result is integrated performance you can't get anywhere else, at any price.



Want to network? Just ask us.

Every NEC Select Solution is available with network boards and Novell® drivers installed and configured to get you connected in no time. When you call, we'll be glad to discuss your individual networking requirements.



NEC PowerMate 433
NEC MultiSync 3FGx Monitor
Pre-loaded Microsoft Windows 3.1
 486/33MHz, 8MB RAM, 240MB hard drive, 1.44MB floppy drive, 1MB video RAM (1024 x 768), integrated fax/modem (2400/9600 bps), Norton Utilities, Microsoft mouse, mousepad, 101-key keyboard, DOS 5.0, remote "co-session" support

\$2,499



NEC PowerMate Express DX2/66
NEC MultiSync 3FGx Monitor
Pre-loaded Microsoft Windows 3.1
 486DX2/66MHz, 8MB RAM (expandable to 256), 240MB hard drive, 1.2 and 1.44 MB floppy drives, 128KB cache, 5 EISA expansion slots, Microsoft mouse, mousepad, 101-key keyboard, DOS 5.0, tutorial software

\$3,779

CIRCLE 394 ON READER SERVICE CARD

Toll-free ordering, guaranteed satisfaction.

Our toll-free hotline is open from 9 am to 8 pm EST, Monday through Friday. When you order, we ship **within 72 hours**—and we mean it. (All prices include FedEx® Economy Two-Day™ Service.) We also give you a variety of payment options, a 1-year limited warranty, a 30-day money-back guarantee, an entire year of free on-site service**, and plenty of expert, toll-free technical support.



If you like, you can upgrade your Select Solution with an NEC MultiSync 4FG, 5FG, or 6FG monitor, add extra memory, and select from a wide variety of hardware options, storage devices and printers.

NEC Select Solutions are also available with pre-loaded, ready-to-run application software from Microsoft, Aldus, and Autodesk. We even offer ready-to-work file servers that actually make it easy for you to set up a Novell NetWare™ LAN.



Sure, you can buy an ordinary system for the same price—without optimized Windows, without NEC hardware, and without our style of service. But why settle for a compromise when you can have a Select Solution?

1-800-374-8000

TO ORDER DIRECT

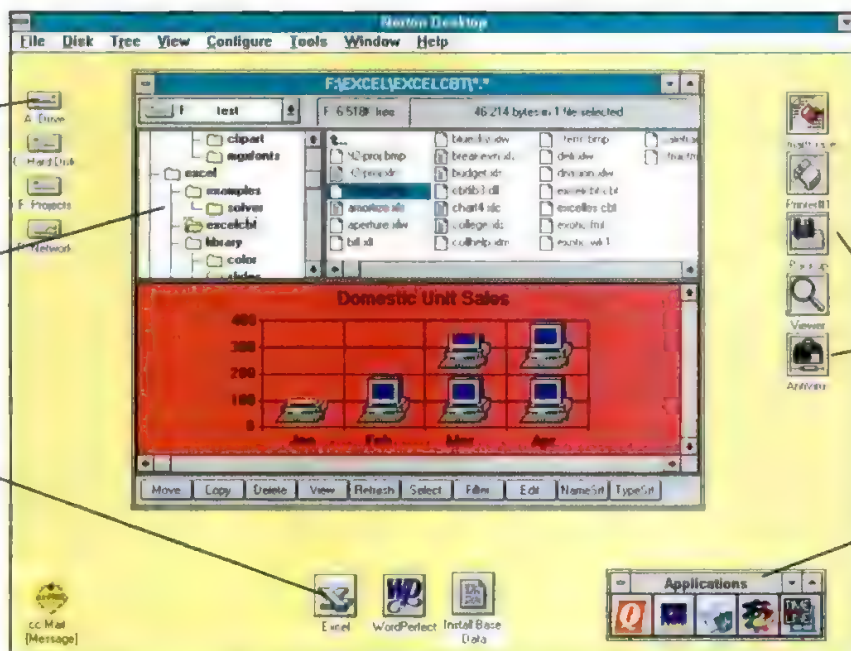
NEC

NORTON DESKTOP FOR WINDOWS SAVES TIME, MONEY, ENERGY, AND DATA.

With Norton Desktop for Windows, your drive icons sit right on the desktop, so you get direct access to your files.

Click on a drive icon for easy file management. The drive window includes a tree pane, file pane, and a customizable button bar with a view option.

For total convenience, applications or files can be dragged onto the desktop for easy access. Open files effortlessly with a quick mouse click or, by dragging the file to the application.



The Norton Desktop is a completely integrated environment. You can drag and drop files from the drive window to a tool, drive icon, application, or onto the desktop itself.

All the utilities you need to backup, protect, and repair your data sit right on your desktop. You can drag files or drive icons directly to the tool you need.

Keep your favorite applications in a handy customizable toolbox. Launch the application easily with just a click of the mouse.

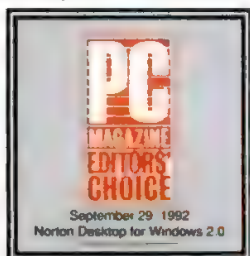
That's a package full of savings. Norton Desktop for Windows 2.0 enhances Windows in all the important ways. It helps you work faster, smarter, and with better results.

Saves Time.

Something you don't have a lot of. We've improved file management, placing drive icons right on the desktop, so you get immediate access to all your files and applications. Speed search, button bar, viewer, customizable fonts, and collapsible tree structure are all designed to save you time. Full drag-and-drop allows you to drag applications and files out of the drive window to anywhere on the desktop so you have instant access to them.

Saves Money.

We all know time is money. And because Norton Desktop looks so much like Windows, you won't have to waste time learning how to use it. You get most everything you need to run your PC in one comprehensive package — a great, money-saving value.



Saves Energy.

Because Norton Desktop can be easily customized, you invest your energy in your work, not in trying to figure out how to get it done. Customizable auto-load frees you from reloading applications that you use daily. And, SuperFind™ allows you to locate "lost" files, across networks or in the background.

Saves Data.

Lost or corrupted data can cost you time, money, and energy. The selection of utilities in Norton Desktop helps you maintain your data. Virus protection and repair, automatic backup, and data recovery can be easily accessed from the desktop; or, scheduled to run unattended, or in the background. Plus, they support all major networks. Norton Desktop for Windows 2.0 is just \$179.00 (S.R.P.) at your dealer. Or, call 1-800-554-4403 for an instant FAX Data Sheet (enter 450).** The sooner you get it the sooner you'll save.



SYMANTEC.

© 1992 Symantec Corporation. * Price in U.S. dollars. ** For information in Canada, call 1-800-465-2266. In Europe, call 31-71-353111. In Australia, call 612-879-6577. Everywhere else, call 408-252-3570. All trademarks or registered trademarks are those of their respective holders.

CIRCLE 186 ON READER SERVICE CARD

Network, Messaging, Admin Pack
NOW AVAILABLE!
Call 1-800-554-4403
or 724 for more information.

Shared-Data Squabbles

Borland-led group challenges Microsoft.

Everybody agrees that different databases should talk to one other. But what language they should speak and who should write the dictionary are hot topics for debate these days. Microsoft thought it had the situation well in hand when the company announced the

ODBC (Open Database Connectivity) application programming interface (API) in November of 1991. But a year later, a Borland-led group rolled out a competing spec called IDAPI (Integrated Database Application Programming Interface). In the same week, Oracle unveiled its Glue API.

According to Lowell Tuttman, senior product manager for ODBC, Microsoft had hoped to prevent "the database API wars" by basing ODBC on the SQL Access Group Call Level Interface (SAG CLI) and by inviting the rest of the industry to review the design. Borland, he says, sent more developers to the ODBC meetings than any other company, but "they never contributed a single idea."

That may be because Borland, Microsoft's toughest competitor in databases, had its own plans for database connectivity, a spec originally named ODAPI (the O stood for Open). Instead of working with Microsoft to expand ODBC, Borland teamed up with three of Microsoft's biggest competitors—IBM, Novell, and WordPerfect—to launch the ODAPI-based IDAPI.

The purpose of ODBC and IDAPI is the same: to provide developers with a standard way of letting their applications share data from different types of databases. The plans have much in common. Both APIs can work on multiple operating systems. (Despite Borland's claim that ODBC is Microsoft

Windows-centric, Apple is supporting it on the Macintosh.) Both specs are "open" (though each group questions the openness of the other). Both are based on specs set by standards bodies (SAG and X/Open). And they will probably work together (although Microsoft cautions that interoperability has not been tested).

Through the stacks of diagrams and the streams of techno-
Continues on page 32

PCMCIA Cards

IT MAY HAVE GOTTEN OFF TO A slow start, but the PCMCIA slot is really starting to soar. You may have had trouble finding anything to plug into the credit card-size slot a few months ago, but now there is a substantial selection of memory, fax/modem (even wireless), hard disk, and network adapter cards. Soon you'll see cards that handle multiple functions—and they won't be confined to portable systems.

"You'll see cost reductions, lower power consumption, more elegant phone-jack solutions, and more integration of the circuitry," says Armando Geday, director of worldwide marketing modem systems for Rockwell International, which makes a V.32bis data and fax chip set for the PCMCIA slot. And, by the end of 1993, he predicts, "You'll see flash memory, modem, and LAN functions all on the same card."

While portables will still make up the bulk of the market, the PCMCIA slot will soon show up on desktop systems. Nicknamed the "green machine" for its low power consumption, the Energy Desktop Prototype shown at IBM's Fall Comdex booth sported four PCMCIA slots, one of which held a 105MB 1.8-inch hard disk being developed by IBM and Maxtor. The PC and the hard disk are planned for release in 1993.

And thanks to the Exchangeability Architecture (ExCA) recently outlined by the PC Memory Card International Association, the next generation of cards will be more easily interchangeable—at least on Intel-based systems. Now, all the slot needs is 32-bit support and a standard BIOS.

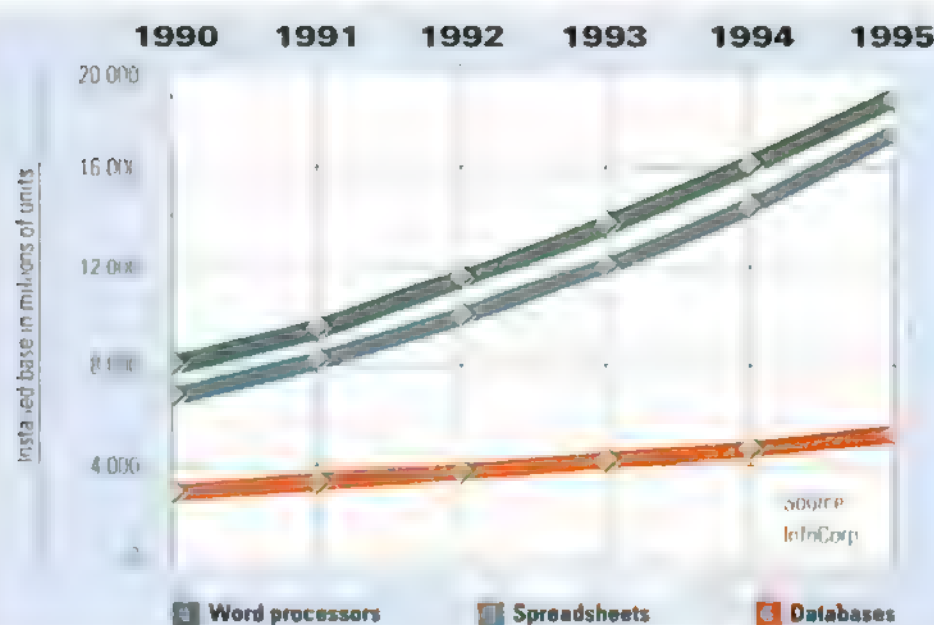
—Mary Kathleen Flynn

Mobile Windows

MICROSOFT'S GOAL OF PUTTING windows on all platforms includes a special version of the operating environment that is being developed for Personal Digital Assistants (PDAs), personal communicators, and other hand-held devices. Mobile Windows, known at Microsoft as MobiWin, is being readied for PDAs and their siblings, and it should be available in 1993.

Windows requires a major renovation to

Databases: Slow but Steady Growth



Competition is getting fiercer in the programmable database market, which, while growing, is still only one-third the size of the spreadsheet and word processor markets.

optimize it for PDAs. The current version of Windows, which hogs 11MB of disk space, is too big to be stored on a PDA's wimpy hard disk, and doesn't have the built-in applications needed by nomads. Mobile users have special requirements that MobiWin will address. It will operate out of ROM, which means it won't take up valuable hard disk space, and it will come up the instant you turn the machine on.

MobiWin will have new applets designed for users on the go. These include an applet for sending and receiving faxes, another for e-mail, and a small personal information manager.

Many PDAs will use a pen interface, so the handwriting-recognition engine is being strengthened, the gesture set is being enhanced, and there will be more emphasis on "ink as a data type" (the industry's euphe-

mism for untranslated scribbles that are stored as images instead of as data).

Mobile users, one of the fastest growing categories of PC users, will be able to access LANs from a remote location. Microsoft is including direct support for networking wireless devices, which may include infrared

and spread-spectrum radio-frequency technologies. MobiWin will also have an automatic synchronizing feature that will let you duplicate one computer's files onto another.

MobiWin will have PCMCIA support and will represent a PCMCIA card as a card icon (instead

of a drive icon) in the File Manager.

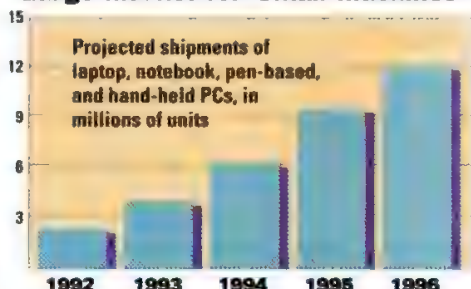
One extremely convenient feature, which was recently introduced in GO Corp.'s PenPoint, will be a common address book. This will be available to all of your applications so you will only need one set of

names, phone numbers, and fax numbers.

This new version of Windows is based on the old Windows—not on the forthcoming Windows NT. It will still operate on top of DOS and in many ways will benefit from the new utilities in DOS 6, like the compression engine (Trends, January 12, 1993). MobiWin will also have the ability to uninstall applications to save space.

—Christopher Barr

Large Market for Small Machines



Source: Dataquest

MobiWin is targeted at the installed base of mobile users, which is expected to increase fivefold by 1996.

IBM's PDA May Be Here PDQ

DOWNSIZING TOOK ON A WHOLE new meaning with IBM's technology demonstration at November's Fall Comdex convention in Las Vegas. Shoehorned into a case the size of a cellular phone was a personal computer with DOS 5.0, e-mail, and a pen interface.

This 1-pound PC was based on an integrated 8086 CPU (along the lines of Chips and Technology's PC/Chip). It had 1MB of RAM, used 2MB of ROM for embedded applications, and had a transfective CGA

1,300 Adobe typefaces, and a smattering of TrueType faces. It matches the metrics of your font using the outline of one of the master fonts. SuperATM is a good beginning, but it is less ambitious than the full solution Adobe has been promising. The good news is that you'll no longer lose formatting information. On the other hand, it is only half a solution, because the substitution is for font metrics, not for font designs. Your line breaks will be the same, but your document will have a different look.

Microsoft's PowerPoint 3.0 uses embedded TrueType font technology to offer a different kind of relief. PowerPoint presentations can travel with the TrueType font embedded in the document. These fonts are then installed on the destination machine. The downside is that a file can grow very quickly, since each font you embed requires anywhere from 70K to 120K of memory. There are some unresolved copyright issues about shipping fonts around with documents, but we'll probably see packages with embedded TrueType capabilities over the next few months.

Another technology to watch is Ares's new Font Chameleon, a \$295 package scheduled to ship at any moment. Ares gives you a single font that can theoretically be modified to look like any font in existence. The company has "paramitized" every part of a font in order to synthesize a custom font on demand. The package ships with a bunch of descriptor fonts that mimic the foundry-designed fonts you use most often. Each descriptor takes about 2K, and you can create your own for new fonts and ship them with your document. You can also blend existing descriptor fonts to create new font designs, although the results may be unattractive. If you prefer, Font Chameleon can generate a font that supports TrueType embedding. If it works as advertised, Ares just may solve the traveling fonts riddle.

Robin Raskin is an executive editor of PC Magazine.

Pipeline By Robin Raskin

Got the Travellin' Font Blues

Being the only person in your department to use the Bodoni font can be hell, especially when your document needs to travel without your PC. If you ship it to colleagues who don't use that typeface, they're stuck with an awful-looking Courier substitution. And if you create a presentation on your desktop that uses a gorgeous Garamond, you may present a plain Courier-based one from your laptop. Why? Because fonts don't travel with documents. Whoever solves the traveling fonts dilemma stands to win big.



PHOTOGRAPH BY PETER GRIGORE

Adobe Systems lost a lot of momentum when Microsoft Windows 3.1 shipped with TrueType fonts. But with SuperATM, a new version of Adobe Type Manager scheduled to ship mid-year, the company may reclaim some of its lost market share. When a machine running SuperATM receives a document that uses a font it doesn't have, it can substitute a "best-fit

font." The substitution takes the form of one of two multiple master fonts—one serif and one sans serif design. Multiple master typefaces are Adobe's sort of universal fonts—they are designed to maintain their design integrity over a wide range of possible font metrics. When you try to display a document for which you don't have the right font, SuperATM substitutes the closest master font. It maintains a database of the metrics for more than

panel that was about 2-by-5 inches in size. For communications, it had cellular voice and data capabilities, and a PCMCIA socket that could be used for hard disks, fax/modems, or LAN adapters.

The applications in ROM include a calendar, an address book that's hooked into the dialer to make either voice or data calls, and a stripped-down version of Lotus's cc:Mail. It used a pen interface for menu selections and could capture and save your scribbles, but it wouldn't recognize handwriting.

The battery life is akin to cellular telephone usage with approximately a 2.5-hour talk time and a 12-hour standby mode. Optionally, it will accept a keyboard and microphone.

While trying to keep a damper on delivery-date expectations, IBM declines to name the product, labeling it simply "hand-held communication technology." But the new IBM—more flexible and faster on its feet than ever before—is likely to bring the product to market in 1993.

—Christopher Barr

Ultimate Upgrade

THAT BABY-BLUE ZIF SOCKET YOU may have seen sprouting like mushrooms on 486-based system boards lately is Intel's latest effort at standardizing the upgrade market. But whether you can upgrade your system to a Pentium-like CPU may depend upon which blue socket you get.

Intel, which pioneered the why-sell-one-CPU-to-a-customer-when-you-can-sell-two? strategy, developed a kitchen-sink socket that system makers can install on system boards. This 238-pin baby-blue socket will accept DX2 and OverDrive chips (which are the same internally), as well as a derivative 32-bit bus version of the Pentium

(code named P24T), which won't be available until early 1994. A full 64-bit bus Pentium system requires a system board overhaul.

Intel will actually promote two different blue upgrade sockets. A 169-pin version is designed for 486SX- and DX-based systems and can't accept the P24T, while the 238-pin version is for DX2 systems and can take the P24T.

But system manufacturers don't always kowtow to the mothership. Zeos International, for example, is shipping the 238-pin socket in its entire new line of desktop systems, from the 486SX-25 to the 486DX2-66, and is staying away entirely from the 169-pin version.

As long as system makers design the memory subsystems to support the Pentium, there's no reason why most systems would not be able to use the 238-pin socket.

While we commend Intel for making upgrading easier, why couldn't the company simply color-code the sockets for us? Make the blue socket for OverDrive, and a purple socket for Pentium. Is that too difficult?

And while we're complaining, we think Intel, and its system vendor customers, should do a better job alerting customers to the differences between future upgraded 486 systems and "true" Pentium-based machines.

—Christopher Barr

Utilities Developers: What, Us Worry?

MAYBE THEY'RE JUST BEING, polite but many developers say they welcome Microsoft's MS-DOS 6 and its expected utilities with an enthusiasm that sometimes borders on elation. The utilities in DOS 6 will set new standards and enhance customers' overall awareness of utility products, they insist in public—though some complain bitterly in private.

Due this spring, MS-DOS 6 will include built-in 2-to-1 disk compression, antivirus software, backup, memory management (including optimization), and serial-based file transfer (Trends, January 12, 1993).

"What's in DOS is the best thing that ever happened to our company," says Mark Eppley, CEO of Traveling Software. DOS 6, says Eppley, will introduce "rudimentary" linking to the operating systems' millions of customers. He believes most network users will be quickly frustrated by the lack of features and turn to his company's

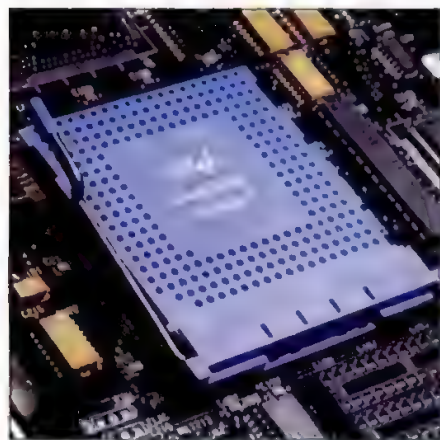
Top Retail Software		
Current ranking	Last issue	Product/company
1	9	Quicken 6.0 Intuit
2	2	Quicken for Windows 2.0 Intuit
3	1	WordPerfect 5.1 for Windows WordPerfect Corp.
4	3	Microsoft Windows 3.1 Microsoft Corp.
5	5	Microsoft Windows 3.1 Upgrade Microsoft Corp.
6	—	Stacker 3.0 Stac Electronics
7	10	TurboTax ChipSoft Inc.
8	6	Microsoft DOS 5.0 Upgrade Kit Microsoft Corp.
9	7	Office for Windows 3.0 Microsoft Corp.
10	4	QEMM-386 6.0 Quarterdeck Office Systems
11	—	Microsoft Word for Windows 2.0 Upgrade Microsoft Corp.
12	—	Procomm Plus 2.0 Datastorm Technologies
13	11	Microsoft Windows for WorkGroups 3.1 Microsoft Corp.
14	—	WordPerfect Windows Upgrade WordPerfect Corp.
15	—	Procomm Plus for Windows Datastorm Technologies

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending November 21, 1992, based on shipments to more than 12,000 retail locations. It does not include direct sales made by software publishers and cannot be interpreted as a picture of the entire market. Sales information compiled by Ingram-Micro.

leading LapLink Pro. Eppley is ready for DOS 6. A major update of LapLink Pro, Version 5.0, is expected shortly.

The attitude is not very different elsewhere. Mary Stanley, CEO of Qualita—maker of 386MAX and BlueMAX memory managers—recalls that when DOS 5.0 shipped, "everyone talked about the death of memory managers." Yet DOS 5.0's native memory manager proved no threat to market-leading products like 386MAX or Quarterdeck Office System's QEMM. Stanley isn't worried about the reported enhancements to DOS 6.0's memory management abilities, either. "We're probably three to three and a half years ahead of where Microsoft is right now," she boasts.

What about utility mavens Symantec and Central Point Software? Well, their story's a little different.



Intel's latest "vacancy" sign.

DOS 6 will include subsets of Symantec's Norton Backup and Speed Disk, and the popular Central Point Anti-Virus. Are these utilities vendors undercutting their own products? Not by a long shot, says Alan Adamson, product manager of the Norton Backup products. Adamson points out that the backup utility in DOS 6 won't include DMA high speed, tape drive support, a scheduler, or a preset mode. Also the Speed Disk kernel is really a reduced product that Adamson believes users will employ only once—during DOS installation.

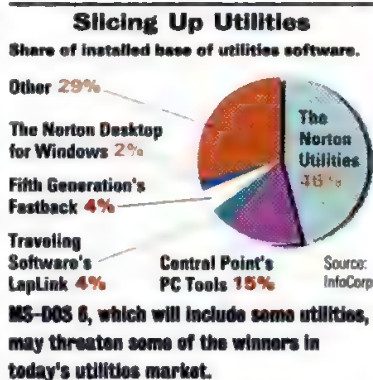
Because the level of virus protection is the same as the full-blown program, "it's a little misleading to call the antivirus product

we're giving to Microsoft a subset," says Central Point Anti-Virus product manager Tori Case. The differences are in orientation: In DOS, the focus is on the individual user. DOS's Anti Virus will offer detection and cleaning, and it will include a TSR program that will check disks and a scanner that looks for known and unknown viruses. Central Point's own free-standing product offers more configuration options and is more tuned for the corporate environment.

So just how happy are these vendors? "My

Christmas card list has been greatly expanded to include the whole DOS 6 team," chuckles Eppley.

—Lance Ulanoff



Database API Wars

CONTINUED FROM PAGE 29

babble, sorting out how ODBC and IDAPI differ from each other is no easy feat, especially since both Borland and Microsoft seem more interested in discussing politics than APIs. Borland vice president and chief database architect Hamid Mirza does a good job of outlining the two approaches.

Microsoft, Mirza points out, announced ODBC before it bought Fox. In those days, Microsoft had no investment in older, record-oriented (also called Xbase-compatible) databases, such as dBASE and FoxPro. The software giant could afford to tailor ODBC to the newer set-oriented (SQL-based and other relational) databases, such as Sybase's SQL Server and Microsoft's new Access. While ODBC allows relational databases to share data with Xbase-compatible ones, it doesn't support some capabilities that, says Mirza, Xbase developers rely on (soft deletes, expression indices, distributed joins, and record-level file locking).

Microsoft does not deny its partiality to relational databases, but the company questions the value of these Xbase functions, which even Mirza agrees are inelegant by today's standards. Microsoft's Tuttleman says the company's research makes him wonder "how many developers actually want to do any of these things. Distributed joins simply aren't in our users' top 100 requests." And ODBC's relational orientation, he argues, is an advantage: "With ODBC, you don't have to know what kind of database you're talking to. But with IDAPI, every developer has to understand both kinds of databases."

What about Oracle's Glue? It's in another world, thankfully. A high-level interface for all kinds of connectivity—including databases and messaging—it is aimed at corporate developers, and isn't a direct competitor to ODBC or IDAPI.

So what's a developer to do? Mirza advises: "If you're a corporate developer, go with Glue. If you're a SQL-only developer, write to the SAG CLI. If you want to go beyond that (for error handling, for example), write to ODBC. If you live in both worlds, go with IDAPI."

And don't count on a truce between Microsoft and Borland any time soon. Long-time enemies in languages, they've only just begun to fight over databases. Borland fired the latest shot in December when it bought WordTech Systems' Arago technology—which will be integrated into dBASE over time—and hired its developers, whose expertise in SQL connectivity will be applied to IDAPI.—Mary Kathleen Flynn

Briefs

IF HE'S FEELING "MICROSLIMED,"

Destiny Technology VP David Larrimore wouldn't be alone. According to a new biography of Microsoft's CEO, *Gates* (Doubleday, January 1993), executives at GO Corp. and some other companies bitterly regret "opening the kimono" to Microsoft. Larrimore says that in the spring of 1991 Destiny shared plans for its WinStyler controllers with Microsoft after the software giant assured him it wouldn't bring a similar product to market (although he couldn't persuade anyone to put it in writing). Now he suspects that Microsoft's Windows Printing System (Trends, December 22, 1992) violates Destiny's pending patents—although he won't be able to prove his suspicions until Microsoft's cartridge ships later in January. Microsoft says it used only its own technology to develop the product.

CHARITY IS BECOMING A MORE COMMON

pastime in the PC industry (Trends, November 24, 1992). At Fall Comdex, more than 10,000 conventioners attended the Grand Scientific Musical Theater at the Fourth Annual Micrografx Chili Cook-Off, a multimedia benefit concert featuring such rock performers as Graham Nash (Crosby, Stills & Nash) and Jon Anderson (Yes).

The event was organized by George Grayson, the recently ousted president of Micrografx, and produced by Scott Page, the saxophonist for Pink Floyd. The proceeds, which had not been tallied at press time, will go to the National Center for Missing and Exploited Children. Microsoft, a sponsor of the concert, also held its own charity event the next morning: the Ready-to-Run-Windows 5K Fun Run. More than 800 Comdexers woke up at dawn to participate in the 6:30 A.M. run, and Microsoft donated \$10,000 to CARE for the organization's Somalia relief effort.

FAULT TOLERANCE, LONG A LUXURY

enjoyed only by mainframe and mini users, is coming to the PC. "By 1995, we'll have RAID on every desk," says Bill North, director of network products at Storage Dimensions. Redundant Array of Inexpensive Disks is making its way into operating systems: Microsoft's LAN Manager for Windows NT (due this spring) will support RAID Level 5.

WINDOWS USERS HAVE SURPASSED

Macintosh users in the number of apps they work with, finds a new study by InfoCorp. Windows users work with an average of 7.9 apps, Mac users with 7.1, and DOS users with 4.9.

—Mary Kathleen Flynn

In Celebration of Our
Unbelievably Low Prices,
We Bring You Yet Another
Unbelievable Act of Lowness.



The ill-fated "Rhapsody for Subsonic Tubas" was performed only once by Frederick Von Stuckman. The notes were so low, no one could hear them. Requests for encore performances were subsequently low.

COMPUDYNE

THE LOWEST OF THE LOW PRICES. GUARANTEED.

Lower Acts You Might Find.



486SX/25
"Honorable mention"
October 13, 1992

WHO? Compudyne is the PC manufacturing arm of CompUSA™ - The Computer Superstore - the nation's largest chain of big volume, deep discount computer superstores.

WHAT? We make top quality, fully-supported computers, and complement them with a vast array of optional PC equipment that no other direct manufacturer/marketer comes close to matching.

HOW MUCH? Our systems are offered at prices typically found only at garage clone shops and we guarantee that our prices are the lowest of any currently advertised.

**EXTRA
VALUE**

A Software Spectacular...

This giant bundle of Windows™ software can be pre-loaded into your new Compudyne system!

A \$1,500 retail value! Call for prices!

- Spreadsheet/Database: Lotus® 1-2-3®
- Wordprocessing: Lotus® AMI Pro™
- Desktop Publishing: Micrografx® Windows Draw™
- Personal Finance: Intuit Quicken®
- Personal Information Manager: Polaris PackRat™
- Information Utility: Prodigy®
- Terminal Communications: DCA Crosstalk®
- FAX Management: Delrina® WINFAX™



Compudyne is probably the fastest growing PC company in the history of the industry.

DIAL TO SAVE DOLLARS
1-800-932-COMP (2667)



ORDERING

- ▶ 1-800-932-COMP (2667)
- ▶ International callers dial: 1-214-702-0055
- ▶ 24 hour fax: 1-214-702-0300



HOURS OF OPERATION

- ▶ 7am-10pm (CST) Mon.-Fri. and 9am-5pm (CST) Sat.

SUPPORT

- ▶ Toll-free technical support
- ▶ On-site service for desktops** and overnight replacement for portables.

WARRANTIES

- ▶ 30-days, no questions asked, return policy.*
- ▶ 1 year limited warranty.

COMPUDYNE

THE LOWEST OF THE LOW PRICES GUARANTEED

*Leasing arranged through Leasing Group, Inc. payments based on 36 month open-end rate **Does not include Windows 3.1 or mouse. Intel™ 386 & 486 & the Intel Inside logo are trademarks of Intel Corp.

Lower Prices You Won't. Guaranteed.



Desktop	CPU	RAM	HD	Floppy	Display	Price
386DX/33	Intel 80386DX-33 MHz	1 standard 32 max	40	1.2 or 1.44	16 bit SVGA card 14" 640x480 VGA Color Monitor	\$849 \$32/mo*
386DX/33 or 486SX/25	Intel 80386DX-33 MHz or Intel 80486SX-25 MHz, with built-in 8K CPU cache	2 standard 32 max	80	as above	as above	\$999 \$37/mo*
486SX/25	Intel 80486SX-25 MHz Built-in 8K CPU cache	as above	80	1.2 & 1.44	16 bit SVGA card 14" 1024x768 SVGA Color Monitor	\$1,199 \$44/mo*
386DX/33 CACHE	Intel 80386DX-33 MHz 64K CPU cache	4 standard 32 max	120	as above	16 bit SVGA card & Hi-Color Support, 14" 1024x768 SVGA .28 Interlaced Color Monitor	\$1,399 \$52/mo*
486SX/33	Intel 80486SX-33 MHz 8K CPU cache	as above	120	as above	as above	\$1,499 \$56/mo*
486DX/33 CACHE	Intel 80486DX-33 MHz 128K CPU cache	as above	120	as above	16 bit SVGA card, 1MB Video RAM & Hi-Color Support, 14" 1024x768 SVGA Non-Interlaced Multisync Color Monitor	\$1,799 \$67/mo*
486DX/50 CACHE	Intel 80486DX-50 MHz 128K CPU cache True 50 MHz CPU	as above	120	as above	as above	\$1,999 \$74/mo*
486DX/66 CACHE	Intel 80486DX2-66 MHz 128K CPU cache New Double Clock CPU	8 standard 32 max	200	as above	16 bit SVGA Superfast Windows Accelerator card, 1MB RAM, 14" 1024x768 SVGA Non-Interlaced Multisync Color Monitor	\$2,499 \$93/mo*

Unparalleled Flexibility...

Order one of our pre-configured systems or custom-configure your own, choosing from a myriad of options. All systems include...

- Microsoft compatible serial mouse
- 101 AT-style keyboards
- Built in serial (2), parallel (1) and game (1) ports
- Microsoft® Windows 3.1 and MS/DOS 5.0
- U/L Listing, FCC Class B cert.
- Artisoft's LANtastic® LAN
- 200 watt power supply
- 8 i/o board slots

Get Horizontal...

Our standard desktop systems feature aesthetic yet rugged plastic-over-steel construction with "one screw" assembly for quick easy upgrades. They support

- 3 externally accessible 5.25" drive bays and
- 2 internal 3.5" units.



Get Vertical...

For those who prefer the aesthetics and foot print of a desktop tower, or need the added drive capacity for file server applications, our mini tower offers an astonishing 6 drive capacity; 4 external plus 1 internal 5.25" and 1 internal 3.5" unit in a mere 8" x 16" desktop footprint for only \$100 more.

Options, Options, Options...

Design the system of your dreams!

- **Displays:** Mono or color VGA; 1024 and 1280 interlaced or non-interlaced; 14" to 20"
- **Hard Drives:** 40, 80, 105, 120, 211, 483, 680 MBs or 1.2 GBs
- **Internal CD-ROM:** (Inc. Groliers Encyclopedia, Toolworks, Reference Library and PC-SIG)
- **Internal FAX/Modem:** 9600 bps send/receive fax; 2400 bps modem; inc. WINFAX and Quicklink.
- **And many more!**

Such
a
Deal!!



If you can find a PC that meets or exceeds our equivalent specifications, but is shipping at a lower advertised price, we'll match the price.



486SX/25
Best Buy,
December 1992

You can also buy these neat products exclusively at

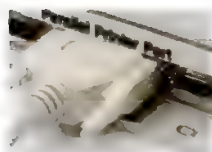
COMP USA
for computer operations



Backup so Simple, It's Advanced.



Introducing Jumbo Trakker™ Printer Port Tape Backup.



Now, backing up your computer is easier than ever. Simply unpack Trakker and connect it to your computer's parallel printer port. That's it. No installation, no

switches, no floppy disk shuffle. This is tape backup that's ready to go. And it goes anywhere. Trakker is light and compact, the ideal solution for backing up notebooks and laptops. And it goes fast. Trakker 250 boasts a

data transfer rate of up to 8 MB/minute, *easily* the fastest in its class. At \$448, Trakker 120 is the price leader as well.

Choose either Trakker 120 (120 MB with data compression) or Trakker 250 (250 MB with data compression). Both offer QIC Industry Standard Recording Format, as well as Novell® and LANtastic® certification.

For more information, please call
1-800-451-0897
ext. 1651 today.

Trakker™
Printer Port Tape Backup

Mini data cartridge sold separately. © 1992 Colorado Memory Systems Inc. All rights reserved. Jumbo, Trakker and Colorado are trademarks of Colorado Memory Systems, Inc. All other trademarks are properties of their respective companies.CIRCLE 026 ON READER SERVICE CARD

First Looks

HANDS-ON EVALUATIONS OF THE NEWEST SHIPPING PRODUCTS

■ Windows Databases

Microsoft Access: Database Power, Graphical Simplicity

BY SAL RICCIARDI

It is rumored that Microsoft Access has been in development for seven years, but however long it's been, Microsoft has used its time wisely. Though Access is not a performance winner, it is a powerful database manager with features that will appeal to database end users, professionals, and developers alike.

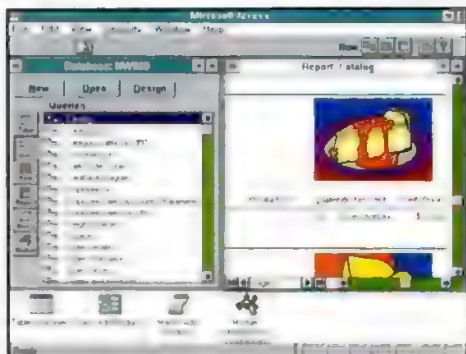
Until now, database programs and their users have been clearly defined. Programmable databases such as dBASE, Fox-Pro, and Paradox are thought of as products for database application developers and power users. Easier-to-use flat-file databases, such as FileMaker Pro

and Q&A, are targeted at end users in search of simplicity.

Access manages to straddle both of these markets by com-

ing and SQL links to remote data with graphical ease of use, drag-and-drop query by example, and elegantly automated report- and form-creation features.

Access will soon be joined by Borland's Paradox for Windows in what is shaping up to be a new generation of visual databases that are powerful enough for serious developers yet easy enough for end users.



NEW METAPHOR: Database as container.

bing a full-blown programming language (based on Visual Basic), multiuser capabilities,

Both products should interest high-end developers, users at the top of the flat-file market,

and those in the middle as well. In view of a very competitive introductory price of \$99 (\$495 after January 31), plenty of potential users should be willing to kick the tires and take the Access program for a spin.

■ A REFRESHING METAPHOR

Access's database metaphor is refreshing. Often, PC database products fail to communicate the big picture—that a database is a collection of tables, indexes, and programs, and that these pieces are related as part of a larger unit and used in combination to solve a problem. Instead, many packages ignore the larger picture or confuse users by applying the terms *database*, *table*, and *database file* all interchangeably.

Access embraces a much more appropriate metaphor. The first thing you'll notice when you build a database is an empty container in which you can create and place database

• Continues on page 38

▶ IN FIRST LOOKS

Sharp Wizard OZ-9600	42
Maplinx, Version 1.0	44
SimDisk Solid State Mass Storage	46
U.S. Robotics WorldPort 2400 V.42bis Modem for Hewlett-Packard Palmtop Computers	46
Crosstalk for Windows	46
IBM Color Jetprinter PS 4079	48
WinFax PRO, Version 3.0	49
VideoSpigot for Windows	50
TI TravelMate 4000 Win DX2	51
PhotoFinish, Version 2.0	51
Adobe Type Manager, Version 2.5	54
Immunity, Version 2.0	54
WinSleuth Gold, Version 3.04	56
Plug-In for Program Manager	56

■ LAN Servers

Compaq Systempro/XL: Smart Downsizing and Data Management, Room to Grow

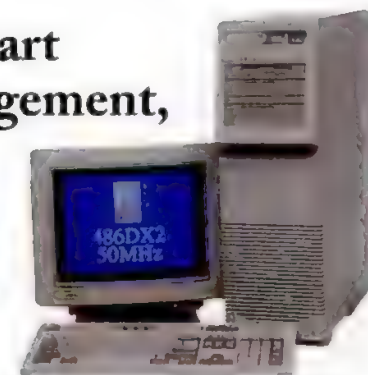
BY RICK AYRE AND
CONSTANTINE FOTOPOULOS

If speed is everything, the new Compaq Systempro/XL is all that matters. The 50-MHz 486-based Systempro/XL is the top of the Compaq server line, built from the ground up to be a fast 486 server, and designed specifically to support the Pentium processor.

The Systempro/XL has three elements that contribute to its success: Compaq's TriFlex System Architecture, a 32-bit

NetFlex network interface card, and the Insight server-management system. The three together are a winning combination.

The Systempros of the past were built with fast subsystems: fast CPUs, disk systems, and memory. With all of these parts assembled, however, the Systempro machines sometimes failed to live up to their promise. They showed heavy CPU utilization and sluggish throughput on PC Labs' NetBench 2.0 (a suite of



HIGH-END: Prices start at \$14,769.

network benchmark tests).

To improve performance, Compaq developed The TriFlex System Architecture. Network throughput is now extraordinary, and CPU utilization—the amount of stress data transfers

• Continues on page 40

First Looks

Microsoft

CONTINUED FROM PAGE 37

objects: tables, queries, forms, reports, macros, and modules. You can't miss the fact that all of these pieces work together; Access won't let you.

This combined view gives you quick access to all of the components of your database and greatly simplifies organization, conceptually as well as physically, since all of the objects are stored together in a single .MDB file on-disk. This choice of metaphor has a lot to do with Access's ease of use.

Access is also a native Microsoft Windows product, and support for drag-and-drop, dynamic toolbars, MDI, and other Windows techniques enhance the product, too. Missing are the ability to use the right mouse button for quick menus and the idea of optional toolbar icon identification when you pass over an icon with the mouse cursor.

Although Access stores data in its own proprietary format, it also reads and updates data stored in Btrieve, dBASE III Plus, dBASE IV, and Paradox 3.x files and their associated indexes. This means you can make the transition to Access without having to migrate your existing data into Access format. In fact, since Access's tools are easier to use than those provided with many products, you might want to use Access as a front end to your existing data, which remains stored in its native format.

In testing, Access was about on a par with Paradox in loading and indexing, but FoxPro proved to be the fastest of the group. Access did especially poorly on the Join test with secondary indexes.

Testing also showed that Access slowed when it took advantage of its ability to attach to dBASE files. This is a good feature but not a fast one.

Access's worst result was on an alphanumeric join based on a secondary index. Though it performed poorly on this test, such operations are admittedly not

done often, and Microsoft was already testing a fix to optimize this kind of query as we went to press.

Access uses the appropriate locking scheme for each foreign format on a network, so you can use Access to work with data at the same time that someone else is using the data with Btrieve, dBASE, or Paradox. For the most part, attached tables can be used just like Access tables. They can be updated, modified, appended, and joined with other foreign tables or with Access tables in a query.

ACCESS AS FRONT END

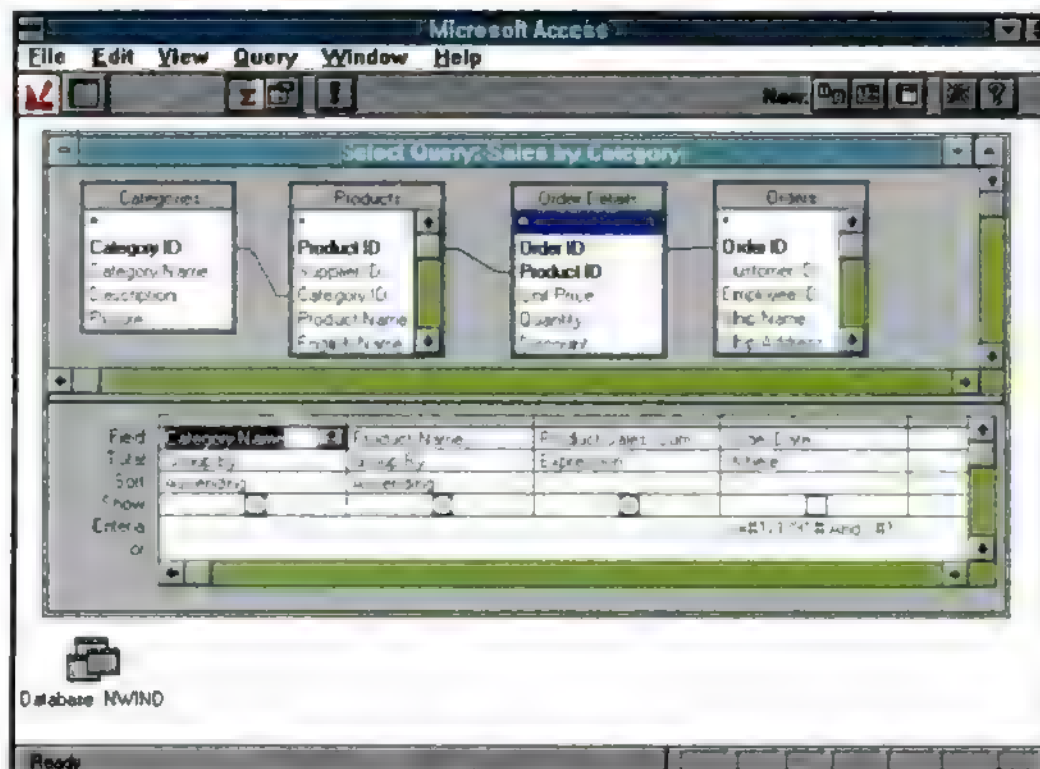
Microsoft supplies an ODBC (Open Database Connection) driver so you can use Access as a front end to Microsoft SQL Server. Notably absent in the initial release is support for attaching FoxPro data files. Microsoft intends to distribute FoxPro support via CompuServe and on request as soon as it's available.

In addition to attaching tables in their native format, you can import and export a number of different foreign file types, including ASCII delimited,

time field types and adds support for currency, memo, counter, and OLE object types. The OLE object type lets you embed or link objects in your table, such as memos greater than 32,000 characters, Word for Windows documents, and sound and graphics files.

The Counter type is a read-only integer value that Access automatically increments for each new record—a big convenience that can be used as the primary key field in many tables. In fact, you can let Access automatically create a primary key for you, in which case it adds a counter field. Access also lets you define a single or multiple-field primary key and automatically creates the appropriate index and prevents duplicate key values.

When you define a field, you can specify validation criteria and a default value to be supplied when a record is added. These table-level criteria can be misleading, since Access does not enforce table-level validation. The criteria specified here serve only as default criteria that are carried forward to your form or report designs.



QUERY CREATION: Drag your tables into the Query window and graphically connect the fields in the tables to specify joins.

ASCII fixed-length, Btrieve, dBASE III Plus, dBASE IV, Excel, FoxPro, Lotus 1-2-3, Microsoft SQL Server, and Paradox 3.x.

Access supports the usual text, number, yes/no, and date/

In truth, Access validates data at the forms level, and the validation is only performed if a field value is changed. If a user enters a field on a form and leaves without changing anything, validation does not occur.

FACT FILE

Microsoft Access, Version 1.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080; fax, 206-936-7329

List price: \$495 (\$99 until January 31).

Requires: 2MB RAM (4MB recommended), 8MB hard disk space, Microsoft Windows 3.0 or later.

In short: Microsoft Access is a very capable Windows database, despite performance problems. Among its highlights are updatable views (the ability to update the results of a query and have the changes reflected in the original tables) support for SQL and graphical query by example, and the ability to update a number of foreign file formats directly.

425 ON READER SERVICE CARD

You can get around this by validating data just before it is committed, but in general this is an area in which Access needs some improvement.

You can define relationships between tables and have Access place certain constraints on what can be done with those tables. If you select the optional Enforce Referential Integrity option, Access will not let you delete a record if references to that record exist. For example, you can't delete a customer record if orders exist for that customer. Similarly, you can't change the customer number in the customer record if references to the original number exist in the database.

Finally, you can't reference a record that does not exist. For example, you can't create an order for a customer unless a matching customer record exists. Database professionals will note that Access doesn't support a cascade option, and it allows foreign keys to be null.

WHAT'S GRAPHICAL QBE?

Access's query facility is easy to use. First, you drag the tables you need from the database container into the Query window. Then you drag the fields

you want from the tables onto the QBE grid. The reason it's called graphical query by example is that you specify join relationships by dragging a field from one table and dropping it onto a field in another. In effect, you drag a line between the two graphically. Access is smart enough to create these joins for you automatically if you've defined relationships between the two tables.

You can then specify the query criteria and execute or save the query. Internally, Access converts your query into a SQL SELECT statement. You can call up the SELECT statement and, if you know what you're doing, edit the statement directly. Changes are automatically reflected in the QBE grid. This can be a terrific learning tool and is a big bonus for SQL gurus. The package also supports UPDATE, INSERT INTO, and DELETE. Support for UNION is missing.

DYNASET: LIVE QUERY RESULTS

Access queries are optimized, and they execute in the background, which means you can start viewing and working with the query results before a query is finished. The output of a query, an updatable view called a *dynaset* (dynamic set), is probably Access's biggest technical achievement. Unlike the query results in many other products, a dynaset is a live object. You can change the data in the dynaset, and in most cases changes are automatically reflected in the source tables. Moreover, a dynaset can itself be the source for forms and reports. This gives you a great deal of flexibility in how you work with your data.

Forms and reports are Windows WYSIWYG, as you'd expect. You can include all of the usual Windows controls on a form, such as radio buttons, check boxes, and drop-down combo boxes. Each control has a suite of properties you can set, such as the source for the data used in the control. For example, you can use a SQL SELECT to populate a combo box.

Performance Tests: Microsoft Access

We evaluated Access's performance by running a series of tests using its native file format as well as attached dBASE IV data and index files. We ran all tests on a Compaq Deskpro 386/25M equipped with 8MB of RAM. Results for FoxPro 2.0 and Paradox 4.0 for DOS are also included.

The **Load and Index** tests measure the time it takes to import four 100,000-row tables from an ASCII file and create 13 indexes. Access's performance was similar to that of Paradox, but FoxPro was faster than either of them.

The **Select** test measures the time it takes to search indexed

numeric and alphanumeric fields, returning 10 percent of the table as a result. Access performed consistently well on this test but showed a significant degradation in performance when attached to dBASE IV tables and indexes.

The **Join** test measures the time it takes to perform two joins on three tables. The first is via a numeric primary key field, the second is on an alphanumeric secondary index. Access performed well on the join utilizing the primary key but very poorly on the join based on a secondary index. Also evident in the results is the overhead hit incurred when Access attaches to nonnative file formats, such as dBASE DBF files.

Seconds	Load	Index	Select (numeric)	Select (alphanumeric)	Join (numeric)	Join (alphanumeric)
FoxPro 2.0	1.634	680	<1	<1	2	1
Microsoft Access 1.0	4.020	2.127	15	16	4	804
Microsoft Access 1.0 with dBASE files	N/A	N/A	47	64	5	2.615
Paradox 4.0 for DOS	5.507	1.913	5	27	1	1

Lower scores represent better performance.

N/A—Not applicable. We did not run this test on Microsoft Access with dBASE files.

Making changes to the properties can be tiresome, however. Access could use a Style facility to apply changes to a number of controls at once.

WIZARDS GIVE A LEG UP

Creating a one-to-many form is a snap. Just create a subform for the *many* portion and drag it onto the main form. Access automatically supplies the correct linkage if you defined table relationships on the tables involved. Forms come with VCR-style controls that let you navigate forward and backward through a table. The creation of forms and reports is made easy by Wizards—Access aids that lead you through a question-and-answer session about your work and then generate forms, reports, and graphs. You'll soon be creating all your form and report designs this way.

The Wizards are themselves written in Access Basic, the Access programming language. Although Access Basic is based on the same language as Visual Basic, with extensions to support database objects, there are enough differences to make the transition a little bumpy. Of course, moving from Xbase or PAL (Paradox Application Language) to Access Basic is a whole lot bumpier. Xbase developers will miss input masks

(such as '(999)999-9999' to define a phone number input field). Access can format a field after the fact but does not support input masks.

The Access macro facility lets you automate tasks and is not to be confused with a key-stroke recorder. You can create sophisticated applications just by using the forms facility and the macro facility—without using Access Basic at all. You can invoke macros by attaching them to events on a form (the "On Click" event, the "Before Update" event, and so on).

Unfortunately, the means by which you attach macros to these events need work. You can define macro libraries, but you can't select a macro from within a library, since Access shows only the library name and not the macro names.

Is Access perfect? No. Testing uncovered some bugs. For example, there are two ways to set a primary key: either by clicking on the key icon or by highlighting the field, setting it to be an index field, and then saying

you want it to be primary. Don't choose the second method or you'll get an "out of memory" message.

Nor will Access propagate a name change. If you rename a field, you have to open up every form, report, macro, module, and query and change the name wherever it's referenced. And the current release doesn't include a runtime facility for developers to distribute applications.

Microsoft plans a Developer's Edition that will provide the runtime and developers' tools.

CHECK IT OUT

Is Access a database manager you should consider? Yes. It combines ease of use with sophisticated technology in an unthreatening manner. Even though some of the pieces aren't in place yet and performance issues remain to be dealt with, it's clear where Microsoft is headed. Access is important both for what it provides now and for what it portends for the future. You'd be wise to take a look. □



To download a demo of Access from PC MagNet, type GO ZNT:DEMOS from any CompuServe prompt. From January 11 through January 15, you can go on-line to discuss Access with PC Labs' software technical director Rick Ayre and Access product manager David Risher. Type GO ZNT:EXEC.

Systempro

CONTINUED FROM PAGE 37

place on the processor—has come down considerably.

Compaq achieves this extraordinary performance by intelligently managing the flow of data as it travels across the 32-bit EISA expansion bus, the 64-bit CPU bus, and the 128-bit memory bus.

The Compaq TriFlex Architecture's 128-bit memory bus allows bus splitting; it also uses bidirectional buffers that cache up to 16 EISA transfers and up to 4 CPU transfers at once. As a result, Compaq says, both the CPUs and boards on the EISA bus can simultaneously access memory more than 70 percent of the time. And that means performance.

NetBench 2.0 tests confirmed Compaq's claims. Using a single 50-MHz 486DX-based processor and four NetFlex adapters, the Systempro/XL showed a remarkable amount of server CPU bandwidth still available, under network loads that severely strained the Systempro 486/33.

TWO CPUS BETTER THAN ONE

The combination of high bus bandwidth and efficient secondary caching means that the Systempro/XL delivers high performance. It also means the performance is scalable: If you have software and an operating system that can take advantage of symmetric multiprocessing, two CPUs together perform far better than one could ever perform alone.

Compaq's new NetFlex adapter also helps boost the Systempro/XL's network throughput. We installed four of these Ethernet cards in the Systempro/XL and discovered that they are as fast as anything we have

tested on NetBench 2.0's network throughput test, including Eagle Technology's top-rated, \$995 Eagle Technology NE3200 network adapter.

Inside the Systempro/XL

435-watt power supply

3 accessible drive bays

8 internal drive bays

12 slots

BUILT-IN FAULT TOLERANCE

Network speed is only half of the Systempro/XL's story. Compaq developed the Insight server-management system to ensure fault tolerance and data protection, too. Every Systempro/XL comes with fault tolerance built into both the memory and disk subsystems.

The Systempro/XL's standard disk subsystem includes such fault-prevention features as dynamic sector repairing and drive parameter checking.

Fault tolerance is also built into the memory subsystem, through the use of advanced Error Correcting Code (ECC) memory. Advanced ECC memory, which has been used for some time on mainframe computer systems, can detect and correct single-bit memory errors by using redundant memory bits. The system continues to operate while memory errors are corrected.

The Insight server-management system can also be expanded, using Compaq's optional Rapid Recovery System. This program includes auto-

matic server problem notification, server recovery, and error log tracking.

FOUR STANDARD CONFIGURATIONS

The Systempro/XL is available in four standard configurations: 550MB (\$13,999) and 1.05GB (\$14,769) Fast-SCSI-2 models, and 1.02GB (\$17,999) and 2.04GB (\$22,299) Intelligent Drive Array models. Each includes a 486/50 System Processor Board, 16MB of Advanced ECC memory, and one NetFlex controller. There is a slot for a second System Processor Board. The computer accepts up to 256MB of RAM on the motherboard; there is also room for 256MB of memory on the system board, and a dedicated 128-bit memory slot that holds an additional 256MB. The unit can hold as many as 11 mass-storage devices.

Compaq still sells the IDA-2 disk subsystem controller, found in earlier Systempros, which supported Intelligent Drive Arrays. This controller can support

a fault-tolerant array of two or four 510MB hard disks and complies with RAID levels 1, 4, and 5.

Alternatively, the Systempro/XL supports a Fast-SCSI-2 controller, which can support as many as seven hard disks and address them as a single, high-performance logical drive.

Compaq designed the Systempro/XL to be a scalable server that can run Banyan's VINES, Microsoft LAN Manager, Novell's NetWare, and SCO Unix. The 64-bit CPU bus also indicates that these systems were designed with Intel's 64-bit Pentium processor in mind. The new Systempro/XL is a screamer that meets today's needs handily and anticipates tomorrow's demands as well.

• List price: *Compaq Systempro/XL with 16MB RAM, Fast-SCSI-2 hard disk controller, 1.05GB hard disk storage, NetFlex adapter, \$14,769. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269; 800-345-1518, 713-370-0670.*

Circle 424 on reader service card

Performance Tests: Compaq Systempro/XL

The 50-MHz 486DX-based Systempro/XL's CPU utilization scores are significantly better than those of the Compaq SystemPro 486/33. Compaq's new TriFlex architecture, with its high-bandwidth buses, contributed to this extraordinary performance. The NetFlex network interface cards compared very favorably to the \$995 NE3200 boards, and, at \$350 apiece, sell for a fraction of the cost.

We used PC Magazine Labs' NetBench 2.0 to measure the Compaq Systempro/XL's network throughput and CPU utilization. The network throughput tests measure the amount of data an adapter can transmit over the network. The CPU Utilization tests measure the amount of overhead the adapter adds to the server. We compared the Systempro XL 486/50, equipped with four Compaq NetFlex Ethernet boards, to a similarly configured Compaq Systempro 486/33, and to a Systempro/XL with four of Eagle Technologies' NE 3200 NICs.



14" IN 1990. 15" IN 1991. 17" IN 1992.

MAG Innovation wins the Editors' Choice year

after year after year, making us truly the growing monitor company of the nineties. THE LATEST ADDITION TO OUR FAMILY of winners is the sensational MX17F, whose "sharp image and competitive price make it a compelling choice." So do the MX17F's advanced features. We've combined the latest flat square tube technology with Invar Shadow Mask for distortion-free images and 30% more brightness. Dynamic focus circuitry keeps the whole screen razor-sharp. And non-interlaced resolution — up to

1280 x 1024 — assures the best picture possible. ALL IN ALL, this microprocessor-based, digitally controlled display is perfect for Windows[®]. Find out more. Contact us at 1-800-827-3998, or

1392 Corporate Center Drive, Los Alamitos, CA 90720. Tel: 714-827-3998. Fax: 714-827-5522.

© 1992 MAG Innovation. All rights reserved. MAG Innovation and its logo are trademarks of MAG Innovation. Windows is a registered trademark of Microsoft Corp. All other brand and product names are trademarks or registered trademarks of their respective owners.



CIRCLE 067 ON READER SERVICE CARD

Pa Sh Ad To

BY JON

Like toddlers, computers are cute but most of all, they're good for something. Like Hewlett-Packard's HP 95LX keyboards for typing. Other BOSS, run programs. Sharp's E-10 radically redesigned OZ-9600 (\$600) change all the rules. It has a large keyboard, a touch-screen, and infrared capabilities. It's a game-changer. The power is in the game played.

OZ-9600

have

as many

a 1-1/2

that

pre

ey

na

AN

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

1

Palmtop Computers

Sharp Wizard Adopts Pen-Based Touch Screen

ATHAN MATZKIN

ers, palmtop comput-
and fun to play with.
of them aren't much
rious work. Some,
-Packard's power-
K, have Lilliputian
at rule out touch
ers, like Casio's
imitive software.
electronics Corp.'s
igned Wizard, the
(49), might just
t. Its newly en-
rd, sophisticated
operating system,
communications
ve the newest
wer to assume
orified calcula-
by past palm-

's screen and
grown larger,
aged to fit ev-
y-7-by-4-inch
's only a tad
decessor, the
spacing is 75
nd on an av-
board, with
half of note-
8 of an inch
s of the al-
ich allows
to sit com-
row. The
akes some
little prac-
ch-typing

D display
0-by-240
array of
You can
ouching
fit with a
lused sty-
res in a
board.

A simple touch also selects text, positions the cursor, or scrolls through files. Screen contrast, while adequate, could be higher.

A group of 15 touch-sensitive icons is printed on a rectangular strip just to the left of the screen. These give direct access to the OZ-9600's twelve applications, as well as to its pull-down menu system and a global search function.

TRUE WORD PROCESSING

The OZ-9600's Notebook text editor function may not be the most attention-getting addition to the system, but it could be the most useful. Sharp has tossed out the wimpy memo software of past Wizards in favor of something that more closely resembles a true word processor. The Notebook app displays 40 columns by 12 lines of text per screen, supports tabs

and indents, and automatically inserts page breaks. You can point and drag with the stylus to select text and then copy it to the clipboard, delete it, or search for other occurrences of the same string. There is even a preview mode that displays page layout, albeit with dummy text.

As with the new OZ-9600's other applications, file size is limited only by availability of the system's 256K internal stor-

OZ-9600's user-customizable database, and searchable text fields can then be used to annotate the drawing or note.

Another slick new function, the Filer, makes ample use of the OZ-9600's graphical interface. Using a file folder visual metaphor, the filer allows the grouping of records or entries from different OZ-9600 applications. You could assign a project heading to a folder, for example, and then access diagrams, text

files, and to-do lists, and schedule entries from that single folder.

Among the other apps are an outliner, a telephone database, a clock with alarms, and a pop-up calculator that can pick up numbers from other applications within the OZ-9600.

Like HP's 95LX, the OZ-9600 has a built-in infrared port that allows fast data transfer between two units. An optional printer adapter (\$149) provides wireless printing on any PC-compatible printer, and a PC adapter (\$149) will, when it becomes

available, allow cableless file transfer to DOS systems. The OZ-9600 also supports the same cable and OL2 software that earlier Wizard models used for PC file transfer and format conversion.

A side-mounted card slot accepts add-in data storage cards in 32K to 256K densities. The slot also accepts software application cards, such as the Lucid 3-D spreadsheet, which were originally designed for the earlier OZ-8600. A 1,200-bits-per-second modem is also available for \$199.95.

Battery life isn't really an issue: you can get up to 80 continuous hours from the system's four AAA batteries.

The aggressively redesigned Wizard has some very impressive technology packed into its diminutive case. If any palmtop can find a significant place in the lives of PC users, this may be the one. □



TOUCH-SCREEN: The Scrapbook function allows direct writing or drawing on the screen.

FACT FILE

Sharp Wizard OZ-9600

Sharp Electronics Corp., Sharp
Plaza, Mahwah, NJ 07430;
800-237-4277, 201-529-8200

List price: \$649, infrared printer
adapter \$149.99, infrared adapter for
PC file transfer \$149.99, memory cards
256K \$299.99, 128K \$149.99, 64K,
\$129.99 32K, \$79.99

In short: Sharp's newest Wizard incor-
porates some powerful new technology,
including a graphical, touch-screen user
interface and a much-improved word
processor

429 ON READER SERVICE CARD

DIRECT DRAWING

Of the new applications, the "Scrapbook" function is easily the most novel. As its name suggests, this app allows direct writing or drawing on the OZ-9600's screen. The display resolution isn't high enough for much fine detail, but you can easily use the stylus to whip out handwritten notes, simple diagrams, or maps. A few simple tools, like an eraser, a choice of three line widths, and a ruler, give the Scrapbook the flavor of more sophisticated drawing packages.

The software saves each screen as a bitmapped image. Scrapbook screens can be pasted into a picture field in the

Introducing PerForm PRO Plus.

Including Free WinFax PRO

Push Button Forms With Intelligence.

Announcing the New Standard in Forms Software

Welcome to PerForm PRO Plus — the incredible new forms software that gives you forms with a Fortune 500 look and dazzling push button power. It's the one tool you need to control and share your day-to-day information — automatically.

Much More Than Forms

Start using PerForm PRO Plus for its outstanding forms design, fill and print capabilities. Then, build intelligence into your forms with calculations and sophisticated functions. Connect your forms with your other Windows applications using DDE and OLE. And use the familiar look of the form as the front-end to your database. You can even access multiple databases simultaneously.

New Intelligent Forms Language™

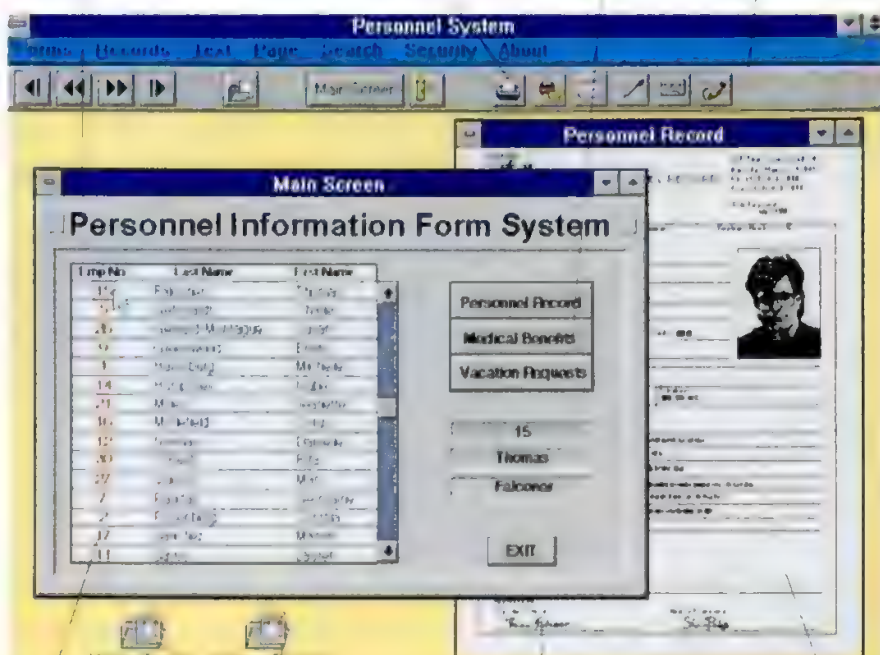
You can use the 5 forms applications — ready-to-go business solutions — and 100 pre-designed forms to become productive immediately. Or, using our Intelligent Forms Language (IFL) you can easily create your own forms applications — without programming! So take a look at the new standard. Push Button Forms with Intelligence.

Develop complete "Forms Applications" using our Intelligent Forms Language — or use the 5 "Forms Applications" included.

We've included WinFax PRO so you can fax your forms.

Create "Push Buttons" to make accessing forms and functions easy.

Customize the menu and ribbons to get one click access to commonly used functions.



Supports dBASE, Paradox, Clipper or ASCII databases (separate SQL modules available).

Link related forms and information.

Includes Windows 3.1 features such as OLE, DDE, TrueType and Multiple Document Interface.

Create professional quality forms, using form and graphic objects such as tables, lines, arrows, buttons and bar codes (includes support for 10 major graphic formats).

CIRCLE 250 ON READER SERVICE CARD

For your FREE PerForm PRO Plus Information Kit (or to upgrade) call:

1-800-268-6082



DELRIANA
Software For Improved Office Performance

■ Mapping Software

MapLinx Puts Your Contact Database on a Map

BY ROCK MILLER

Desktop mapping packages such as Atlas Pro can help you perform wonders of demographic analysis, but using the heavy-duty feature set of such a package just to plot a few sales contacts is tedious overkill. Fortunately, MapLinx for Windows Professional, Version 1.0, manages by dint of creative simplification to take a lot of the pain out of this process while retaining a base of essential abilities.

MapLinx's lucid design is focused on a single goal: to help you plot and select business contacts on maps of the United States. The Professional edition (\$399.95) comes with a comprehensive geographic database, including state, county, city, and ZIP code boundaries. The basic version (\$149.95) has all of these features except shading by ZIP code.

Preparing databases for mapping is usually one of the most annoying tasks when using a mapping package. Not with

this one: Tying your contact databases to the map (up to three, in .DBF format or in the proprietary format used by Contact Software's ACT! for Windows) couldn't be easier. You simply tell the system which field contains the ZIP code, and it's taken care of, with no brain-twisting

down, and you can pop up the details of each record by double-clicking on the listing or on the map point itself.

Once you've selected the records, you can export them in a variety of word processor merge formats for use in mail-merge documents. Or you can feed them as query files to ACT! for Windows, making MapLinx a geographical front end for selecting records within ACT!

Though bereft of layout niceties such as insets, MapLinx can produce attractive printed maps, taking advantage of Microsoft Windows' font, color, and printing options. State outlines are highly detailed, and you can turn on city outlines for greater verisimilitude on the metropolitan scale.

Unfortunately, you are limited to 16 text annotations of a single line each, and there are no other drawing tools. Worse, you can't reposition the map title/legend box, which may obscure what you want to show in its lower-right position. Legend options are skimpy, and you can't calculate thematic ranges from your data; you must select the ranges manually.

DELIBERATE LIMITATIONS

There is plenty of room for improvement in this first effort. In

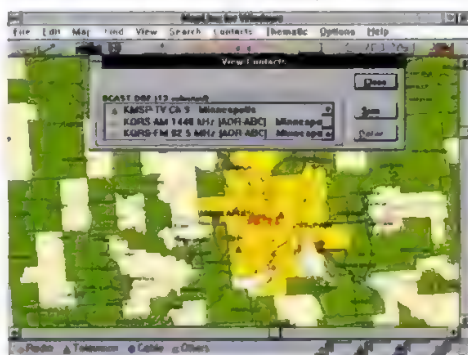
particular, the program's deliberate limitations can be overly constraining.

For instance, you can shade states or ZIP code regions thematically or by plotting points, but this is an either/or proposition: You can't display points over a thematic map to analyze, say, customer locations overlaid on a shaded map of underlying demographics.

The program supports only three user-defined data fields in addition to basic address information. You can classify contacts into only four different types, and the point symbols can't be resized. Finally, you can't export a map into an editable file: Your only choices are to snap a section from the screen to the clipboard in bitmap format, or to print out the entire page to a file using the Windows drivers.

Though redraws are quite snappy, the program does not allow you to stop redraws manually. Though our test version handled a 1,300-record subset of our database with ease, it crashed when called on to load all 7,500 records. And a puzzling bug (to be fixed in a maintenance release), refuses to recognize the field used to categorize the records unless it is one character larger than the longest.

These minor complaints shouldn't blind you to the po-



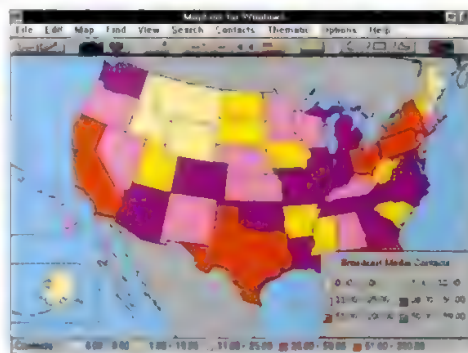
RADIUS SEARCH: One way in which MapLinx selects, plots, and displays contacts.

geocoding required.

A well-designed interface, with a handy toolbar and clear menus, makes MapLinx a snap to use. You can turn additional elements, such as interstate highways and cities, on and off at the push of a button, and the program automatically reveals greater and lesser levels of detail as you zoom in and out. Though there is no pan or area zoom, there is a nice "bird's-eye" window that makes it easy to move around. You can measure distances in miles or kilometers as well; the distances are displayed directly as you work.

GEOGRAPHIC SELECTION

Geographic selection is equally straightforward. Though you can't select points on the basis of map regions such as states or counties, you can select records based on a radius, a rectangle, or a free-form polygon. You can display or summarize selected records in a scrolling list win-



COLOR-CODED: This thematic map is shaded by the number of contacts in each state.

tential of this easy-to-use mapping package. If you have contacts to manage and would like to map them quickly and simply, MapLinx for Windows will do the job for you. □

FACT FILE

MapLinx for Windows Professional, Version 1.0

MapLinx Corp., 5068 W. Plano Pkwy., Plano, TX 75093; 800-352-3414, 214-231-1400; fax, 214-733-8193

List price: MapLinx for Windows Professional, \$399.95. MapLinx for Windows (without ZIP code area boundaries), \$149.95.

Requires: 2MB RAM, 12.5MB hard disk space, Microsoft Windows 3.0 or later.

In short: This cleverly simplified mapping program is well adapted to the simple task of plotting and selecting customer contacts.

ON READER SERVICE CARD



The best reasons in the world to choose Primavera software.

The Olympic Games, Atlanta

Facilities for the 1996 Summer Games in Atlanta will use Primavera Project Planner® and Expedition®.

The Autobahn, Germany

P3® will be used to rebuild the Autobahn in what was formerly East Germany. Both contractors and subcontractors are standardizing on Primavera for this project.

U.S. Embassy, Bolivia

Primavera software is being used to control the construction of the new \$30 million U.S. Embassy in La Paz.

Kuala Lumpur Tower, Malaysia

This \$100 million, 420-meter tower will be the third tallest communication tower in the world. Estimated completion date is 1996.

Melbourne Cricket Ground, Australia

The new 47,000 seat Great Southern Stand replaces the smaller original built in 1937. Finest Hour® helped schedule and coordinate the project's extensive concrete work.

Remote Sensing Satellite, Canada

RADARSAT is a low orbit satellite that will take radar images of the earth. The engineering, design and manufacturing stages for this \$300 million project are being scheduled using P3.

New Hong Kong Airport, Chek Lap Kok Island

This \$20 billion airport construction project also includes the construction of highways, an airport rail system, a suspension bridge and a cable stay bridge. Projected completion is June 1997.

Think about project management, and one name comes to mind. Primavera.

It's the software that people who run projects have come to rely on.

Talk to us for a demonstration of Primavera capabilities in scheduling, resource management, cost control, performance measurement, contract control, communication and risk analysis.

We've got all the software you need to put your project on the map.



PRIMAVERA
*How the world says
project management*

Two Bala Plaza • Bala Cynwyd, PA 19004 • USA
(215) 667-8600 • FAX (215) 667-7894

International Business Park • Europe Building
F-74166 Archamps • France • 33-50 31 57 80
FAX 33-50 31 57 85

■ Communications Software

Crosstalk for Windows: Total Overhaul of High-End Communication Tools

BY RICK AYRE

The new Crosstalk for Windows is indeed a whole new communications program, despite the fact that Digital Communications Associates has chosen to call it Version 2.0. It is a powerful \$195 offering that joins DynaComm Asynchronous for Windows 3.1 and MicroPhone II for Windows on the top shelf of Microsoft Windows communications software.

Crosstalk for Windows has been completely redesigned and rewritten. Joined together are the best features of all of DCA's DOS programs, including the strong CASL programming language from Crosstalk Mark 4 and the easy-to-use NEWCALL profile-creation system from the Crosstalk Communicator. The whole thing is wrapped up in a clean new Multiple Document Interface (MDI). DCA has turned a popular program into an outstanding one.

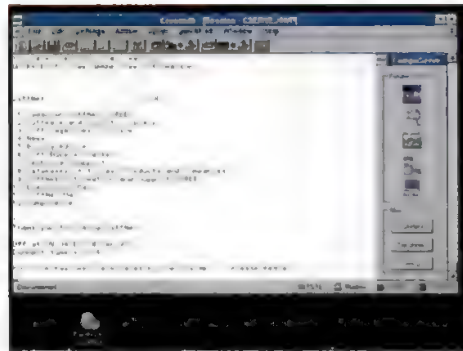
New features include QuickBar, the prerequisite Windows icon bar. QuickBar is context-sensitive, so it changes as your work does. There are, for example, QuickBars for sessions and for the text editor.

Unique to Crosstalk is QuickPad, a custom on-screen keypad that you can configure to give yourself quick access to commands in communications sessions, like your favorite GO commands when you're logged onto CompuServe. Crosstalk also includes a built-in text editor and an easy-to-use graphical keyboard editor, so you can customize your keyboard by dragging and clicking.

Of course, Crosstalk includes a full set of file-transfer protocols, from the venerable Xmodem variations to the newest Zmodem and CompuServe

B. It also includes all the necessary terminal emulations, beginning with the DEC VT family (VT52, VT100, VT102, VT220, VT320) and continuing in a very long list.

Crosstalk doesn't escape the excess of jargon that jams most communications software, both in DOS and Windows. You need to understand *sessions*, which are roughly analogous to



ICON BAR: New in the Windows version.

what most programs call dialing directories or phone books. You also need to know what a *profile* means to Crosstalk—that it's where you configure the options for your sessions.

Crosstalk isn't the long-awaited Windows comm breakthrough. Still, it's closer than we've yet come. Once you know the terms, the rest is easy.

• List price: *Crosstalk for Windows, Version 2.0*, \$195. Requires: 2MB RAM, Microsoft Windows 3.1. Dig-

ital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202; 800-348-3221, 404-442-4000; fax, 404-442-4366.

Circle 431 on reader service card

■ Palmtop Accessories

SunDisk Flash Memory and U.S. Robotics Modem Make HP 95LX More Useful

BY RICK AYRE

No number of add-on gadgets will convince a skeptic that Hewlett-Packard's HP 95LX palmtop is really a useful computer, but those who can't live without their 95LX will be thrilled by new products from SunDisk and U.S. Robotics.

SunDisk is shipping two 5-volt, SDP Solid State Mass Storage Drives for the HP 95LX. The 5MB and 10MB PCMCIA cards are priced at \$599 and \$999, respectively.

At about \$100 a megabyte for the 10MB version, this kind of storage doesn't come cheap, but it's small, easy to install, and as fast as the HP 95LX in every way. It's also reliable, both in the ways that flash memory always is and in ways that are HP 95LX-specific.

SunDisk moves data around on the disk to insure the longest possible life (to get the most from the 100,000 writes to every 64K sector, which is the maximum one can reasonably expect from flash memory). To insure

against data loss due to battery failure during disk writes on your 95LX, the drive refuses to write when the battery is low.

The 10MB SunDisk drive we tested was easy to use. We installed it and copied the ACT! contact manager from the 95LX's skimpy C: drive to the expansive SunDisk A: drive, and that was it.

Then we tried out the U.S. Robotics WorldPort 2400 V.42bis Modem for Hewlett-Packard Palmtop Computers, a modem much smaller than its name. Weighing 6.5 ounces, it costs almost as much as a basic HP 95LX (\$249), fits snugly into the HP 95LX cradle, and is as easy to use as any good modem.

The SunDisk drive provides disk space, the U.S. Robotics modem lets you communicate, and the little 95LX looks a lot more like a real PC.

• List price: *SunDisk Solid State Mass Storage Drives: 5MB*, \$599; *10MB*, \$999. *SunDisk Corp.*, 3270 Jay St., Santa Clara, CA 95054; 800-688-7177, 408-562-0500.

Circle 434 on reader service card

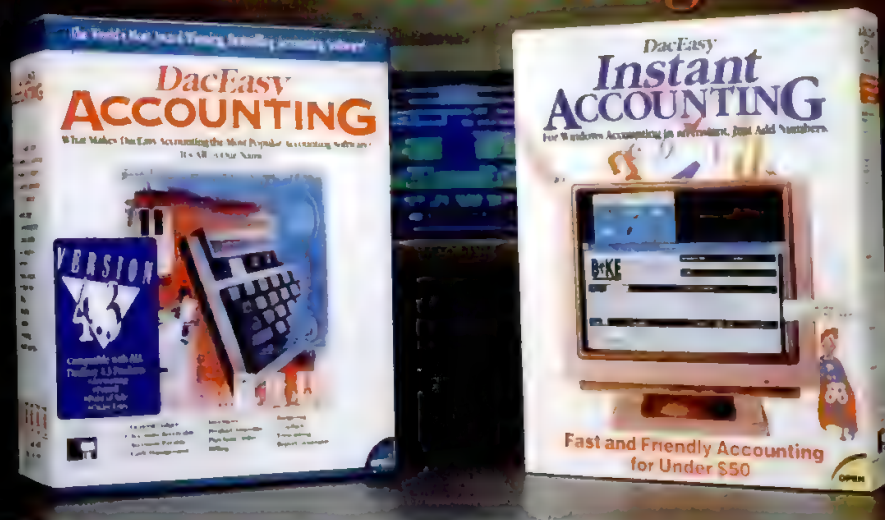
• List price: *U.S. Robotics WorldPort 2400 V.42bis Modem for Hewlett-Packard Palmtop Computers*, \$249. *U.S. Robotics Inc.*, 8100 N. McCormick Blvd., Skokie, IL 60076; 800-342-5877, 708-982-5001; fax, 708-982-5235.

Circle 435 on reader service card



ADD-ONS: Better storage and communications.

Finally, The Business Accounting Software You've Been Asking For.



New, Improved DacEasy Accounting™ 4.3 Faster, More Powerful and Still Number One.

Every second, 2.7 checks are printed with DacEasy Accounting software, the number one selling business accounting program in the world. Why?

Maybe because it's so complete. It has 11 integrated modules to invoice customers, pay bills, manage inventory, track cash transactions, process purchase orders, build a budget, monitor performance, forecast business growth, and more.

Or maybe it's because DacEasy Accounting has received more editorial and reader chosen awards than all the other business accounting programs combined.

Or, maybe it's DacEasy's relentless pursuit of continuous improvement. Introducing, DacEasy Accounting Version 4.3.

It has more customer requested features, it runs faster, it uses less RAM and requires less disk space. Plus, its new screens, handy shortcuts and improved processing and printing speeds increase user productivity by as much as 20%.

Use DacEasy Accounting by itself, or add DacEasy Payroll and DacEasy Point of Sale for more power.

DacEasy Payroll 4.3 is the most complete payroll and personnel management program available. New Version 4.3 is now even more complete, with the addition of Direct Deposit capabilities, labor-saving time-card support, and much more.

And DacEasy **Point of Sale 4.3**, whether used alone or perfectly integrated with DacEasy Accounting 4.3, turns any 286 or better PC into a complete cash register accounting system.

New, DacEasy Instant Accounting™ Easy Business Financial Management, and More.

PC Magazine says, "DacEasy Instant Accounting offers relief for the accounting-phobic small business." (9/17/92)

So even if the word "Accounting" scares you to death, you can easily invoice your customers, pay your bills, and access important information, like who owes you money and how much, with DacEasy Instant Accounting on your PC. And then use its built-in contact management capabilities to phone, fax or mail-merge payment reminders to your past due customers.

Plus, unlike checkwriter programs and other entry-level accounting programs, DacEasy Instant Accounting gives you an audit trail (something your accountant will insist on).

And, if your accounting software needs change, you can move up to DacEasy Accounting 4.3, and take your DacEasy Instant Accounting data with you. DacEasy Instant Accounting is the only entry-level contender with an upgrade path to meet your needs, no matter how much you grow.

No matter how small your business accounting needs are, or how big they get, DacEasy has your software. Ask for DacEasy Accounting 4.3 or DacEasy Instant Accounting today.

	Dustin Price
DacEasy Accounting 4.3	\$99
DacEasy Payroll 4.3	\$69
DacEasy BonusPack 4.3	\$129
DacEasy Point of Sale 4.3	\$99
DacEasy Instant Accounting	\$39
Free Ground Shipping Included	

30 Day Money-Back Guarantee

Call Toll Free from anywhere in the United States
Monday thru Friday - 6 AM to 5 PM PST.

1-800-945-6887
Or Fax Your Order to
1-818-884-5310



Plain Wrap Prices,
Black Tie Service.

All prices subject to change. Dustin Discount Software, 20969 Ventura Blvd, Suite 13, Woodland Hills, CA 91364 (818) 710-9174

■ Color Printers

\$3,495 IBM Jetprinter Makes a Colorful Mark

BY ALFRED POOR

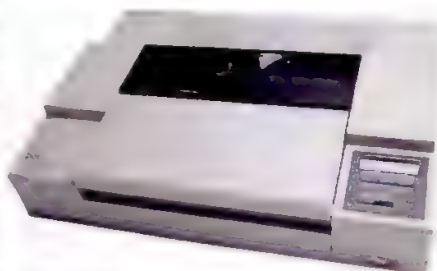
Ink jet technology is hot in the color page printer market, and Lexmark (a spun-off division of IBM) has turned up the heat with its new IBM Color Jetprinter PS 4079. Priced at \$3,495, this model is a strong competitor in the midrange color printer competition.

The Color Jetprinter uses four different ink cartridges: black, cyan, magenta, and yellow. The cartridges are rated at 205 pages at 15 percent coverage and cost \$24.75 for black, \$34.75 for the colors. Thanks to a clever design, you can't stick a cartridge in the wrong place, since each color is physically keyed to match the appropriate slots. The printer can sense when a cartridge is empty and will pause until you insert a new cartridge. Lexmark rates printing costs at 15 cents per page on plain paper and 26 cents per page on special coated paper.

The printhead has four sets of permanent-ink jet nozzles, but the printer takes care to prevent clogs. It goes through a purge cycle on power-up (which you can also initiate through the panel controls). If you are printing a complex image that does not use one or more colors for a long period of time, the printer will sense that the ink jets for those colors may be at risk of drying out, and will pause in the middle of the print process to purge those heads.

Even with the pauses, the printer is fairly fast. In draft mode, it managed 1.6 pages per minute on our text speed test

and 0.9 ppm in quality mode. ("Draft" and "quality" are somewhat misnamed, since they both produce essentially the same image; the first mode does it in just one pass, while the second takes two passes.) The 360-dot-per-inch print quality in both cases was excellent—using special paper, the text rivaled laser printer output. For graphics, the printer managed 0.36 graphics pages per minute in draft



JETPRINTER: A strong midrange competitor.

mode, and 0.32 gppm in quality mode.

Colors were vivid, with very little sign of banding, and registration was excellent. The printer uses Lexmark "Color-Grade" screening technology,



which results in excellent color mixing and smooth gradient fills. Graphic artists will also appreciate the fact that the Color Jetprinter is Pantone-licensed for color matching.

Part of the printer's speed comes from its 16-MHz, 32-bit AMD RISC processor. This CPU is backed by 4MB of memory in the base model, which can be expanded to a total of 16MB. The extra memory may be needed if you print complex images on 11-by-17-inch pages.

SIMPLE CONFIGURATION

Connecting and configuring the Color Jetprinter is easy. It comes with parallel, serial, and Apple-Talk ports, and, with the use of an optional connector (list price \$39), all three ports can be active simultaneously. Unlike some printers that lock out the other ports during a print job, this one can dynamically allocate memory to buffer other incoming jobs. The printer is also designed for shared use on a network, and it incorporates Lexmark's version of a high-speed parallel port.

The "PS" in the Color Jetprinter's name refers to its PostScript emulation. While it doesn't use Adobe PostScript, it does use an interpreter that was developed by Lexmark and Phoenix Technologies. It also includes 35 Type 1 scalable fonts. The

FACT FILE

IBM Color Jetprinter PS 4079
Lexmark International Inc.,
740 New Circle Road NW,
Lexington, KY 40511;
800-358-5835; 606-232-2000;
fax, 800-522-3422

List price: \$3,495, 4MB upgrade, \$419, 8MB upgrade, \$749, black ink cartridge, \$24.75; color cartridges, each \$34.75
In short: Vivid colors, 360-dpi resolution, and PostScript-compatible emulation make the IBM Color Jetprinter an attractive option for under \$4,000

ON READER SERVICE CARD

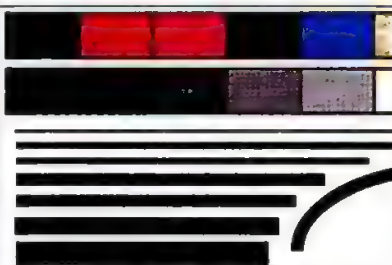
printer has a plotter emulation mode and can automatically switch modes based on the incoming data stream.

Configuration is easy using the LCD message window and front panel controls. There is even a special slow-print mode specifically designed for inexpensive paper that is prone to the ink "wicking" through the paper fibers; the printer pauses after printing each line of each color to give the ink time to dry before proceeding with the next color.

The Color Jet-printer also comes with one major feature that has long been common for computer systems but is only beginning to appear in printers: an on-site service policy. The base price includes a full year of on-site warranty service, provided either by IBM or your dealer.

In terms of its price, performance, and features, the IBM Color Jetprinter PS 4079 compares favorably with its main competitor, the HP PaintJet XL 300. While you can certainly expect more announcements for quality color printers under \$5,000 in the near future, Lexmark has clearly made its mark in the marketplace. □

Our wretched species is so ma
walk on the well-trodden path
at those who are showing a ne
Normal Bold Italic co



OUTPUT: On special coated paper, text output rivals that of lasers.

HELLO

Glad you could stop and look at our ad.

*Reading this magazine is confusing,
isn't it? Every PC ad says the same
thing these days. Who can you believe?
Believe in yourself. You're smart. Strip
away all the hype and you'll know a
good buy when you see one. You want a
great computer at a great price – from a
solid company that'll take care of you.
At Gateway, that's what we offer. Take a
look at our products and services –
then give us a call. Simple!*



MINI DESKTOP SYSTEMS

GATEWAY 2000

386SX-25

- 25MHz Intel® 386SX Processor
- 4MB RAM
- 5.25" and 3.5" Diskette Drives
- 80MB 17ms IDE Hard Drive
- Windows Accelerated Video with 1MB DRAM (Faster Than Local Bus VGA!)
- 14" Color CrystalScan™ 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey™ Keyboard
- MS-DOS,® Windows™ & Mouse
- Cool Tools for DOS
- MS Works for Windows™ 2.0

\$1295

GATEWAY 2000

486SX-25

- 25MHz Intel 486SX Processor
- 4MB RAM
- 5.25" and 3.5" Diskette Drives
- 170MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Windows Accelerated Video with 1MB DRAM (Faster Than Local Bus VGA!)
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- MS Works for Windows 2.0

\$1495

■ Gateway ranked #1 in PC Magazine's 1992 Service & Reliability Survey

■ Gateway systems give you the ultimate performance

■ All 486 ISA systems have Intel Over Drive sockets



GATEWAY2000

4SX-33

- 33MHz Intel 486SX Processor
- 4MB RAM, 64K Cache
- 5.25" and 3.5" Diskette Drives
- 170MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Windows Accelerated Video with 1MB DRAM (Faster Than Local Bus VGA!)
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$1695

GATEWAY2000

4DX-33

- 33MHz Intel 486DX Processor
- 4MB RAM, 64K Cache
- 5.25" and 3.5" Diskette Drives
- 250MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Windows Accelerated Video with 1MB DRAM (Faster Than Local Bus VGA!)
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$1995

■ *One-year limited warranty and 30-day money-back guarantee*

■ *All systems are FCC Class-B, UL and CSA certified*

■ *Free lifetime toll-free technical support*



8 0 0 - 5 2 3 - 2 0 0 0

DESKTOP AND TOWER SYSTEMS

4SX-33V

- 33MHz Intel 486SX Processor
- 8MB RAM, 64K Cache
- 5.25" and 3.5" Diskette Drives
- 170MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- VESA Local Bus ATI Ultra Pro with 1MB VRAM (Faster Than The New ATI Graphics Ultra!)
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 with 32-Bit VESA Local Bus
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$2195

4DX-33V

- 33MHz Intel 486DX Processor
- 8MB RAM, 64K Cache
- 5.25" and 3.5" Diskette Drives
- 250MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- VESA Local Bus ATI Ultra Pro with 1MB VRAM (Faster Than The New ATI Graphics Ultra!)
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 with 32-Bit VESA Local Bus
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$2495

■ *Gateway's local bus meets VESA standards for compatibility*

■ *On-site service available to most locations*

■ *Free lifetime BBS membership*



GATEWAY 2000

4DX2-66V

- 66MHz Intel 486DX2 Processor
- 8MB RAM, 64K Cache
- 5.25" and 3.5" Diskette Drives
- 340MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- VESA Local Bus ATI Ultra Pro with 1MB VRAM (Faster Than The New ATI Graphics Ultra!)
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 with 32-Bit VESA Local Bus
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$2995

GATEWAY 2000

4DX2-66E

- 66MHz Intel 486DX2 Processor
- 8MB RAM, 128K Cache
- 5.25" and 3.5" Diskette Drives
- 500MB 11ms SCSI Hard Drive
- 32-Bit EISA SCSI Controller
- Windows Accelerated Video with 1MB DRAM (Faster Than Local Bus VGA!)
- 14" Color CrystalScan 1024NI
- Tower Case
- 8 32-Bit EISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS, Windows & Mouse
- Cool Tools for DOS
- Choice of Application Software

\$3795

■ We custom-build each Gateway 2000 system to your specifications.

■ Please call a sales representative for other configurations.

■ All software is pre-installed and ready to run.



8 0 0 • 5 2 3 • 2 0 0 0

PORTABLE SYSTEMS

GATEWAY/2000

HANDBOOK™

- Weight: 2.75 Lbs.
- Dimensions: 5.9" x 9.75" x 1.4"
- 4.5-Hr. NiMH 2.3Ah Battery and AC Adapter/Charger
- Alkaline Battery Pack
- 286-Class Performance
- 1MB RAM, Upgradeable to 3MB
- 40MB Hard Drive
- Backlit 7.6" CGA Screen
- 1 Parallel and 1 Serial Port
- 78-Key Touch-Type Keyboard
- MS-DOS 5.0, LapLink® XL, MS Works™ for DOS, Central Point® Desktop & Serial Download Cable
- Carrying Case

\$1295

GATEWAY/2000

NOMAD

- Weight: 5.6 Lbs.
- Dimensions: 8.5" x 11" x 1.8"
- 6-Hr. NiCad 5.7Ah Battery and AC Adapter/Charger
- 4MB RAM
- 3.5" Diskette Drive
- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video
- 1 Parallel and 1 Serial Port
- 79-Key Keyboard & FieldMouse™
- MS-DOS 5.0 and Windows 3.1
- MS Works for Windows 2.0

NOMAD 325SXL ■ \$1795
25MHz 386SXL, 80MB Hard Drive

NOMAD 420SXL ■ \$1995
20MHz 486SXL, 80MB Hard Drive

NOMAD 425SXL ■ \$2295
25MHz 486SXL, 120MB Hard Drive

NOMAD 425DXL ■ \$2695
25MHz 486DXL, 120MB Hard Drive



Peripherals and Upgrades

Microsoft® Windows® for Workgroups

- E-mail, group scheduling and resource sharing
- Includes Ethernet adapter and software
- Hardware and software factory installed

\$159 (with the purchase of a system)

CD-ROM Kit

- MPC-compliant, manufactured by Sony®

\$225

Microsoft Windows Sound System

- Speak to your PC for hands-free operation
- PC reads numbers back for proofing
- Embed audio messages in OLE applications
- Soundboard, microphone, headset and software

\$149 (with the purchase of a system)

The TelePath® Fax Modem

- 14,400 bps modem/9,600 fax, V.32bis
- Includes WinFax Pro™, Crosstalk™ for Windows, Qmodem™ and more

\$195

CrystalScan™ 15-Inch Monitor

- Flat, square screen, non-interlaced

\$100 (to upgrade from 14-inch 1024N1)

Panasonic KXP2123 Color-Capable Printer

- 24-pin dot matrix, includes Adobe Type Manager®

Printer **\$259**, Color Option **\$50**



Free Software

For systems with "choice of application software," pick the latest version of one of the following:

- Microsoft Excel for Windows™
- Microsoft Word for Windows™
- Microsoft® Word and Bookshelf 92,® CD-ROM edition
- Microsoft PowerPoint for Windows™
- Microsoft Project for Windows™
- The MS Entrepreneur Pack (Works,™ Publisher,™ Money,™ and games)
- Borland Paradox® or dBASE IV®
- The Windows Programmer Pack (MS Quick C,™ Visual Basic and more)
- Upgrade to Microsoft Office™ for \$175

Cool Tools for DOS, a diagnostic and utilities package, comes with all Gateway desktop systems and includes:

- QA Plus™ from DiagSoft™
- Central Point® Anti-Virus, RAM Boost, Defrag and Emergency Disk

For details on our complete line of components, peripherals and software, call direct to our special Enhancements Division at 800-252-3333.



8 0 0 - 5 2 3 - 2 0 0 0

GOOD BUY



8 0 0 - 5 2 3 - 2 0 0 0

610 Gateway Drive • P.O. Box 2000 • North Sioux City, SD 57049-2000 • 605-232-2000 • Fax 605-232-2023
Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (CT)

©1992 Gateway 2000, Inc. AnyKey, HandBook, FieldMouse, CrystalScan and TelePath are trademarks of Gateway 2000, Inc. Intel Inside is a Registered trademark of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. Prices and configurations are subject to change without notice. Prices do not include shipping.

Fax Software

WinFax PRO 3.0: Total Fax Management

BY EARLE ROBINSON

Imagine not having to wait for the office fax machine and not having to deal with curled fax paper and jammed fax machines. Programs such as WinFax PRO, Version 3.0, are turning the PC into a more attractive, though still imperfect, fax platform.

At \$149, WinFax PRO 3.0 fixes many of its predecessor's weaknesses—the installation procedure is much improved and fax transfers are faster—and offers many new features as well. These include V.17 (14,400 bits-per-second) fax support, the ability to annotate incoming faxes, optical character recognition (OCR) to convert faxes into editable text, a vastly expanded phonebook, improved fax management features, and support for scanners compliant with the new Twain specification (a widely accepted standard programming interface for input devices).

The program supports Class 1 and Class 2 fax modems, CAS-compatible fax devices, and fax modems based on the Sierra Send-fax (send only) chip set.

MODEM DETECTION

During the well-crafted install procedure, WinFax PRO 3.0 analyzes your system's modem and asks you for confirmation. Like most Microsoft Windows-based fax programs, it installs as a Windows print driver. This allows you to write a memo in a Windows word processor as usual. Then, instead of sending the document to your printer, WinFax PRO 3.0 takes over and sends output to your fax modem for transmission.

The program comes with a large library of sample cover pages that you'll either adore or detest: The library itself requires 2.4MB of hard disk space and increases installation time to over 20 minutes. The full program requires a lot of disk space, too—over 7.5MB. Luckily, you may select a partial installation, but there is no uninstall feature.

WinFax PRO 3.0's performance is far more reliable than its predecessor. Both CAS and Class 1 modems perform well under it, even on a slow 386SX-based system, but problems exist with Class 2 modems. Changing the modem setting to Class 1 will usually solve this. One valuable configuration option sends a string when you exit the program to return the modem to data mode.

You should avoid background faxing on slower systems due to possible problems of timeouts, which, though less frequent than in the earlier version, may still occur. And, unless you've got a very fast system, you should avoid automatic OCR on incoming faxes.

CAERE-FUL OCR

WinFax PRO 3.0 uses the AnyFax OCR engine licensed from Caere Corp. (Caere's own FaxMaster also uses AnyFax.) OS/2 users and users with 286-based systems will be disap-

and spots resulting from transmission.

Like other fax programs, WinFax PRO 3.0 uses its own file type, but you can export files to .BMP, .PCX, or TIFF formats or paste files into the Windows Clipboard. The package also includes dynamic data exchange (DDE) and object linking and embedding (OLE) support for Windows programs, which enables you to embed graphic images into files for faxing.

Keeping track of incoming and outgoing faxes or digging up

DIALER: WinFax PRO has a full-featured phonebook.

pointed since the engine runs only in Windows Enhanced mode. Though the AnyFax engine is comparable to a standalone OCR package, OCR for faxes is still more of a promise than a reality.

Since most faxes are sent in standard mode (96 dots per inch), it's virtually impossible to get a reliable scan of text from incoming faxes. Even faxes sent in fine mode (200 dpi) from a standalone fax machine are far from error-free. Results are better with faxes sent from a fax modem. Interactive scanning and spell checking offers some help for correcting errors.

Along with OCR, Delrina has included annotation and drawing tools for marking up a fax before resending or forwarding. You can save these notes along with the fax or store them separately. A new cleanup feature removes random specks

an old fax for reference can be tedious procedures. WinFax PRO 3.0's new fax-management features make it all easier.

The expanded phonebook is well designed and thorough, the best one we've seen for a fax program. There's a country code field that's useful for laptop users on the road, as well as new fields for billing codes and notes, a custom field, and the standard descriptive fields. You can search on each field and organize contacts into groups for easy multiple faxing. If you've got an existing contact list in ASCII, CAS, dBASE, DosFax PRO, or WinFax format, WinFax PRO can import it. You can work directly with contact information from PackRat.

WinFax PRO 3.0 represents a growth spurt in both size and features. It offers occasional and heavy-duty users a reliable solution for PC-based faxing. □

FACT FILE

WinFax PRO, Version 3.0

Delrina Technology Inc., 6830 Via Del Oro, #240, San Jose, CA 95119; 800-268-6082, 408-363-2345; fax, 408-363-2340

List price: \$149; (Introductory price, \$129); Upgrade, \$49

Requires: 2MB RAM, 3MB hard disk space (7.5MB for cover sheets and OCR), Microsoft Windows 3.0 or later.

In short: WinFax PRO 3.0 is a reliable Windows-based fax program that does it all—send and receive, OCR, annotation, fax management and archiving. It supports 14.4 kilobits-per-second modems and the new Twain specification for scanned images.

ON READER SERVICE CARD

■ Multimedia

VideoSpigot Pours Full-Motion Video Into Your PC

BY JOHN R. QUAIN

In the wake of Microsoft's Video for Windows introduction, a crowd of full-motion video digitizing boards are arriving on the scene. SuperMac's moderately priced and well-behaved \$499 VideoSpigot for Windows is one of the first.

The VideoSpigot won't improve the speed of motion of video seen on typical PCs, but it will enable you to do what Video for Windows software alone can't: capture digital motion video in Microsoft's .AVI format to your hard disk. Designed to hook up to a VCR, laserdisk player, or camcorder, the VideoSpigot lets you bring your own video clips into multimedia presentations.

SuperMac's hardware and software bundle couples a 16-bit ISA Digital Video Frame Grab-

ber board with Video for Windows and three strong multimedia authoring packages.

Unlike Intel/IBM's Action Media II, the VideoSpigot doesn't perform accelerated video decompression to improve playback. But for about half the price, the VideoSpigot offers real-time, near-full-motion video capturing.

EASY INSTALLATION

The hardware itself is straightforward. The expansion board connects to a video source via a composite video (RCA jack) input or an S-video input, and the incoming analog video signal is digitized on the board using a proprietary algorithm that enables the board to manage the process in real time.

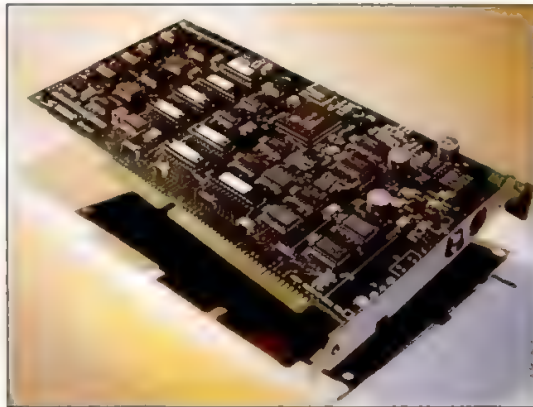
Setting up the board is nearly effortless. There are no jumpers on the card; IRQ and memory settings are software-selectable. Three IRQs are supported (10, 11, and 15) and memory demands (from 8K to 128K) can be accommodated in upper memory. Changing the settings is as simple as clicking on a dialog box entry.

SuperMac includes two software-selectable AVI-compatible capture formats. YUV 4:2:2 provides the best color fidelity and quality but no compression. It's simply a digitizing format that converts analog video into digital information. The uncompressed video is then stored on your hard disk.

To compress the data, you must open Microsoft's VidEdit application and save the file or

use SuperMac's second capture format, the VideoSpigot codec (compression/decompression algorithm). This codec digitizes video using a YUV approach but offers a 2-to-1 compression ratio. A 10-second 24-bit video clip can still require 12MB of storage, however.

The VideoSpigot's compression is performed in system memory in real time and then passed off to the hard disk. The compression calculations add overhead, which means the VideoSpigot's codec capture frame rate isn't as high as in the YUV 4:2:2 method; the former achieves about 20 frames per second (fps)—depending on the size of the window—while the latter can reach 30 fps.



VCR-TO-PC: The VideoSpigot captures video clips.

What you're able to see and what you're able to store varies from PC to PC. The specified maximum resolution at which the VideoSpigot captures video is VGA with 24-bit color. (Synchronized 16-bit, 44.1-kHz stereo sound can also be recorded, but you'll need an MPC-compliant sound board.) This is, however, a theoretical limit, since the VideoSpigot provides no acceleration on its own. On a 33-MHz 486-based PC using the maximum capture rate and size, the best you're likely to achieve is a couple of frames per second, making it unsuitable for any motion work at this resolution.

Typically, capturing 30 fps requires a 33-MHz or faster 486-based PC, and the image size must be reduced to 160 by 120 pixels using YUV capture. En-

large the image to 320 by 240 pixels and you'll get about 15 fps—far short of the 24 fps required for full-motion video.

SMOOTH PLAYBACK?

Ironically, although you can store 20-fps motion video or better, you won't be able to play it back that fast. What you see on playback depends on the amount of CPU utilization and the speed of your VGA subsystem. Generally, you won't see video playback improve over what Video for Windows by itself can produce—which is a little jumpy.

The VidCap applet can capture video from an NTSC (National Television Standard Committee), SECAM (Sequential Color and Memory), or PAL (Phase Alternate Line) video source. SuperMac also lets you capture single frames or motion video from a composite or S-VHS device and select a VCR source. Home VCRs typically deliver less stable video signals, so when you select VCR mode, the VideoSpigot samples the signal more frequently to keep things on track.

EXTRA SOFTWARE

The VideoSpigot comes with three multimedia authoring packages from Asymetrix. MediaBlitz and Multimedia Make Your Point are editing programs for quick multimedia presentations. Multimedia Tool-Book is a sophisticated authoring package that cleans up rough captures and builds complex applications.

PC users looking to enter the multimedia fray will be pleased with the ease of use and reasonable price of the VideoSpigot for Windows. It's a fine video capture solution for adding video clips to applications. Just don't expect it to display true full-motion video on your 386-based PC. □

▶ FACT FILE

VideoSpigot for Windows

SuperMac Technology Inc.,
485 Potrero Ave., Sunnyvale,
CA 94086; 800-334-3005, 408-
245-2202; fax, 800-541-7680

List price: Including Microsoft Video for Windows, MediaBlitz, Multimedia Make Your Point, and Multimedia Tool-Book, \$499

Requires: 25-MHz 386SX PC or better, 8MB RAM, 200MB hard disk, Microsoft Windows 3.1, MPC-standard audio board for synchronized sound

In short: Compared with other solutions, the VideoSpigot is a relatively inexpensive way to capture and play back full-motion video for use in multimedia applications

ON READER SERVICE CARD

■ Notebook PCs

TI TravelMate 4000 WinDX2/50: Portable Speed Demon

BY EMERSON ANDREW TORGAN

Imagine lugging around a 50-MHz 486DX2-based PC on your next business trip. Now imagine that it weighs only 5.6 pounds. The \$3,899 Texas Instruments TravelMate 4000 WinDX2/50 is a 486DX2-based notebook running at a speed-doubled 50 MHz. The monochrome system is a number cruncher's portable dream machine, right down to its math coprocessor.

The unit we tested ships in standard configuration with a math coprocessor installed, 8K cache, 1MB of VRAM, 8MB of RAM (expandable to 20MB), an internal floppy disk drive, a 200MB hard disk, and DOS 5.0 and Microsoft Windows 3.1 preinstalled.

The WinDX2/50 performed outstandingly on our benchmark tests, turning in scores far above average on our Processor and Memory test suites, and equally impressive scores on our Disk and DOS Video test routines. Its Graphics Winmark score was a strong 3.49.

Texas Instruments uses nickel hydride manufacturing technology in its enhanced nickel cadmium battery, claiming between 3 and 5 hours of battery life when using its Advanced BatteryPro Power Management software. When we performed our worst-case-scenario Battery Rundown test with all power-saving options turned off, the speed-doubled processor drained the enhanced nickel cadmium battery in 3 hours 4 minutes.

The 10-inch monochrome LCD is capable of 64 shades of gray, has 1MB of Video RAM, and supports simultaneous display of an external SuperVGA monitor with 256 colors. The TSTN (Triple Super Twist Nematic) screen features cold-cathode fluorescent tube back-

lighting, and is prone to ghosting, especially in Windows.

The WinDX2/50 offers nothing special on its run-of-the-mill keyboard—miniature function keys and PgUp, PgDn, Home, and End keys hitching rides on cursor keys. But gone from this Texas Instruments notebook is the company's TravelPoint pointing device, only to be replaced by Microsoft's QuickPort



NUMBER CRUNCHER: The TravelMate 4000 features a math coprocessor.

Ball-Point mouse. One of the first two manufacturers to offer the new pointing device on their high-end notebooks, TI built a QuickPort socket into the right side of the system.

The new BallPoint instantly snaps into place—no cables or clamps—and snaps off harmlessly if accidentally dislodged.

The TI TravelMate 4000 WinDX2/50 is a lightweight speed demon. With its 200MB hard disk, fast processor and math coprocessor, it could conceivably be your choice for both travel and the desktop, but only if an external monitor is waiting at the end of the trip.

• List price: TI TravelMate 4000 WinDX2/50, \$3,899. Texas Instruments Inc., Information Technology Group, P.O. Box 202230, ITG-017, Austin, TX 78720; 800-527-3500; 817-774-6900; fax, 817-774-6660.

Circle 427 on reader service card.

■ Image Editing Software

PhotoFinish 2.0: Zoom In On Business Users

BY BARRY SIMON

One year ago, ZSoft Corp. redefined image-editing software when it released the under-\$200 PhotoFinish. Micrografx parried with PhotoMagic, and now ZSoft rebounds with PhotoFinish, Version 2.0, a \$199 Microsoft Windows-based program that scans, edits, filters, and transforms bitmapped images in gray scale, 256 colors, or full 24-bit color.

Support for the JPEG file compression format is new, and the program continues to support .BMP, EPS, .GIF, .MSP, .PCX, .TGA, and TIFF files.

PhotoFinish still offers the best multiple-image handling through full MDI (multiple document interface), image duplication either as two different views of the same image or as two unlinked images, and synchronization of magnified and normal views.

Enhancements include the new PhotoLibrary, which stocks 200 photos (50 ship with the product; the rest are available for \$10 when you register), an excellent image manager, support as an OLE server, printer/scanner/monitor calibration, six new editing tools, and 12 new filters, such as crystallize, posterize, and mosaic.

But perhaps the biggest improvement of all is AutoEnhance, which automatically rotates scanned images so that they're not skewed, crops them (which eliminates white space),

age Assistant and Source's Ofoto. Like PhotoMagic, PhotoFinish also displays thumbnails, but goes beyond in its ability to copy, delete, and move images right from the thumbnail view.

PhotoFinish's weak point is its selection tools. It has a magic wand, rectangle, freehand, polygon, and ellipse selection, but has no way to manipulate a mask. For example, you can rotate a selected region, but you can't rotate the bounding curve to change the region selected.

While PhotoMagic's selection tools are far superior, PhotoFinish does offer some unique features, including flood fills, painting with a tiled pattern, autostitching, and a useful "open clipboard" command.

Alongside PhotoMagic, the image-editing software choice is a toss-up. But with both of these low-cost products available and the eagerly anticipated high-end Adobe PhotoShop for Windows expected soon, it looks like the mid-priced packages are being squeezed out.

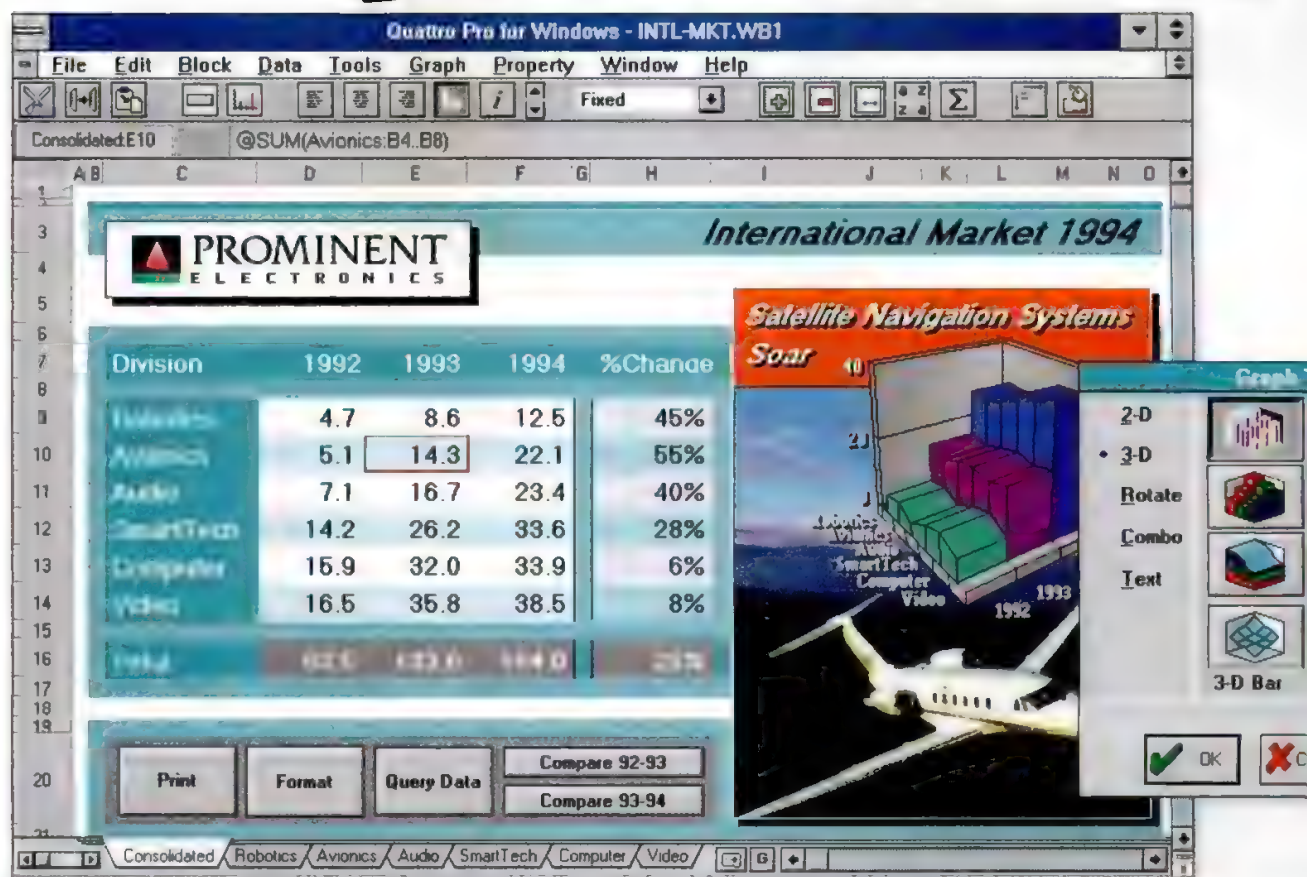
• List price: PhotoFinish, Version 2.0, \$199; upgrade, \$69. Requires: 2MB RAM (4MB recommended), 4.5MB hard disk space, Microsoft Windows 3.0 or later. ZSoft Corp., 450 Franklin Rd., #100, Marietta, GA 30067; 404-428-0008; fax, 404-427-1150. Circle 430 on reader service card.



SPECIAL EFFECTS: PhotoFinish has many.

corrects color, and removes Moire patterns; these are similar to features in Caere Corp.'s Im-

Excel and 1-2-3- Quattro Pro



Quattro Pro for Windows is the easiest-to-use spreadsheet ever made. Built with Borland's renowned object-oriented technology, Quattro® Pro for Windows is packed with hot new features you won't find in any other spreadsheet.

NEW! Spreadsheet Notebooks with customizable Tabs are nothing less than a revolution in spreadsheet ease of use. Now you can intuitively organize and manage your spreadsheet data.

NEW! Object Inspector™ menus end the hassle of searching through menus. They're simpler than 1-2-3. Just click the right mouse button anywhere on the screen to get a list of what you can change and change it right there.

NEW! Database Desktop™ is the easiest way to incorporate dBASE™ and Paradox® data into your spreadsheet. Just what you'd expect from Borland, the leader in database technology.

NEW! SpeedFill™ and **SpeedFormat™** slash setup time by automatically filling in spreadsheet headings and formats.

NEW! SpeedBars™ are customizable and context-sensitive. SpeedBar icons give pushbutton access to your most frequently used commands.

NEW! Presentation Graphics and drawing tools that rival those of Freelance and Harvard Graphics are built-in. You don't need to buy a separate graphics package.

YES! Compatible with Lotus 1-2-3 files, macros, and publishing styles; Excel .XLS files; and eight graphic formats. Quattro Pro for Windows offers the best spreadsheet, database, and graphics file compatibility available.

3 users prefer for Windows

Notebooks

Object Inspector

Database Access

1-2-3 Compatibility

Windows Offer

An independent test proves...

It's a fact: two out of three Excel and 1-2-3 spreadsheet users tested prefer Quattro Pro for Windows to their current spreadsheet. They say it makes you more productive and is easier to learn and use. That's the result of a study conducted by

Usability Sciences Corporation, a highly regarded independent testing lab used by major software publishers, including Lotus.

◀ *The Object Inspector makes it easy to view and select your options.*

▼ *WYSIWYG printing makes it easy to create high-impact reports.*

...the easiest-to-use spreadsheet...



Quattro Pro for Windows is the most advanced, yet easiest-to-use spreadsheet ever created for the personal computer.

Thanks to the use of new object-oriented technology, Borland has radically simplified the use of the world's most feature-rich spreadsheet. With Quattro Pro for Windows you get your work done faster because you work visually. Simple point-and-click operations are all that's needed to complete any spreadsheet task—from building your spreadsheet to creating dazzling graphical reports.

...makes you more productive

Never before has so much spreadsheet power also meant this much user productivity. Spreadsheet Notebooks and Object Inspector menus are breakthrough concepts that make it easy to tap the awesome functionality of Quattro Pro.

Only Quattro Pro for Windows gives you transparent access to database information. Borland's unique Database Desktop lets you view, edit, and copy dBASE

and Paradox tables directly from within Quattro Pro. Plus, we've included all the tools you'll ever need for creating your own custom spreadsheet applications.



Quattro Pro for Windows
November 10, 1992

**"Quattro Pro
for Windows is a
better spreadsheet
than Excel 4.0."**

—Computer Shopper, November 1992

1-2-3 and Excel users tested prefer Quattro Pro for Windows two to one. But why not see the world's best Windows spreadsheet for yourself? Get Borland's new Quattro Pro for Windows today.



Offer good until December 31, 1992, or while supplies last.

**Buy Quattro Pro for Windows,
get Quattro Pro for DOS, FREE**

**See your dealer today or call now,
1-800-331-0877, ext. 5919**

In Canada, call 1-800-461-3327.



B O R L A N D
Software Craftsmanship

Copyright © 1992 Borland International, Inc. All rights reserved. All Borland product names are trademarks of Borland International, Inc. Quattro Pro for Windows and Spreadsheet Notebooks have patents pending. Photo furnished by Cessna Aircraft Company BI 4954.1

CIRCLE 287 ON READER SERVICE CARD

Windows Utilities

Adobe Type Manager 2.5 Is Faster and Simpler

BY EDWARD MENDELSON

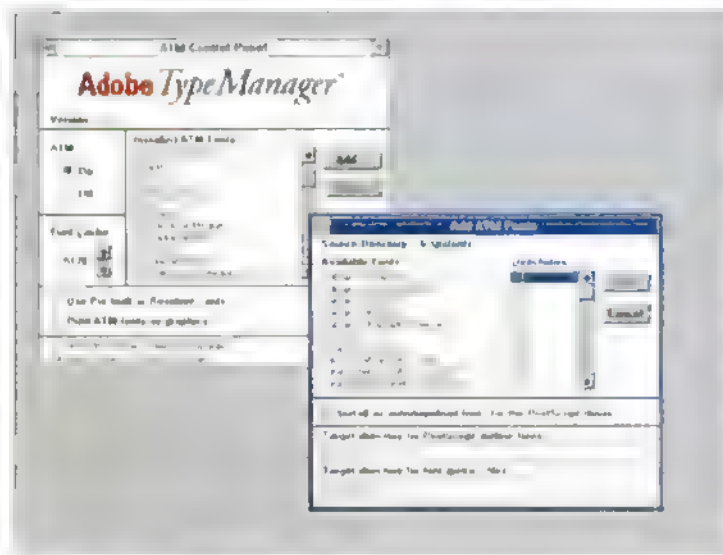
The two leading WYSIWYG font scalers for Microsoft Windows are TrueType, which is built into Windows itself, and Adobe's \$99 Adobe Type Manager, which works as a separate add-in. Adobe Type Manager (ATM) works with tens of thousands of typeface designs that you can't find in TrueType format, but, until now, ATM lagged behind TrueType in speed and convenience. Version 2.5 of Adobe's \$99 utility gives it all the speed and sleekness that it lacked before. (This is not Su-

per ATM, which is scheduled to arrive later this year.)

When printing to non-PostScript printers, earlier versions of ATM created graphical images of every character on the page. This meant that Windows sent a separate bitmap of the letter "A" to the printer every time the letter appeared in your text.

In contrast, TrueType and

other Windows font scalers created bitmapped soft fonts when printing to LaserJets or compatible printers, so the printer received the image of the letter



TYPE WRITER: ATM's simple menu.

only one time and then reused it as needed.

ATM 2.5 downloads soft fonts when printing to LaserJets, and its speed effectively matches

TrueType's. These soft fonts print at 300 dots per inch in most printers, but the LaserJet 4 gets 600-dpi soft fonts in Hewlett-Packard's new high-resolution soft font format. You can still print in the old graphic manner, which is also the only way ATM or TrueType can work with dot-matrix printers.

ATM used to require you to restart Windows whenever you installed or removed a font. Now you can make changes and continue working, as you can with TrueType.

The font format used by ATM is the Type 1 format built into PostScript. Ironically, ATM used to cause more headaches if you used a PostScript printer than it did with any other model, because it could install fonts into WIN.INI for use with PostScript printers but didn't remove them when you uninstalled them from ATM itself. The current version removes fonts as easily as it adds them.

ATM now lets you install fonts for a PostScript printer so that they won't be downloaded every time you print. This means you'll have to download the fonts separately each time you print.

For \$29.99, you can upgrade earlier ATM versions, including versions bundled with packages like Ami Pro or PageMaker. The new version comes with ten well-designed Monotype typefaces in addition to the standard 13 PostScript faces. An offer you will find inside the box also makes 16 more faces available for an additional \$39.

TrueType alone brings superb type to Windows, but for the widest range of designs and the greatest variety of special symbols, Adobe Type Manager remains the one indispensable add-on for Windows.

• List price: *Adobe Type Manager, Version 2.5*, \$99; upgrade \$29.99. Requires: *Microsoft Windows 3.x*. *Adobe Systems Inc.*, 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039-7900; 800-642-3623, 415-961-4400; fax, 408-655-6096.

Circle 421 on reader service card

Backup

Immunity: Mirroring Utility Eliminates Downtime

BY STEVE RIGNEY

Would your business come to a halt if you couldn't get at the data in your PC? If so, you're pinning your income on an electromechanical platter spinning at 3,600 rpm. While a backup tape is useful only after you suffer through the downtime needed to replace a drive, the disk mirroring utility Immunity, Version 2.0, from Unitrol Data Protection Systems provides nonstop processing for any PC with two hard disks running DOS or Microsoft Windows.

Priced at \$249, Immunity provides complete fault-tolerant data protection for your standalone PC or DOS-based LAN Server.

Immunity implements RAID (Redundant Array of Inexpensive Disks) Level 1 and provides 100 percent disk mirroring or duplication between two hard disks. If one disk develops errors or gives up completely, the program

continues operation on the other. The failure of one disk doesn't cause a fault in the operation of any program. A lost hard disk causes no downtime.

Immunity runs as a 20K device driver in your CONFIG.SYS file and functions with any two hard disks. The mirrored disks do not have to be identical, as long as the two separate controllers work together without special software. The program ships with both DOS and Windows interfaces.

Each time you restart your PC, Immunity checks both hard

disks to ensure that they contain exactly the same data. If it finds an inconsistency, it sounds an alarm and disables mirroring. You can then run the Immunity utilities to find the problem.

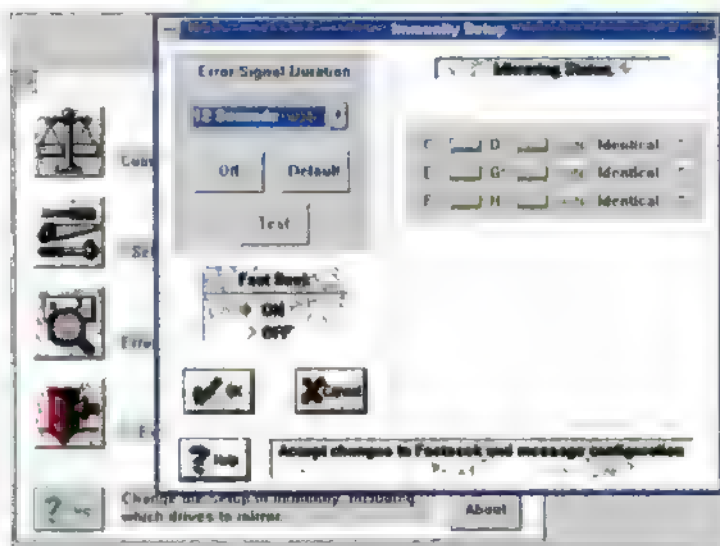
A utility called Fastseek retrieves data from whichever hard disk head is closest to the data on the disk. This function increases access time and lessens wear on your hard disks.

If you use a rewritable optical drive as your second hard disk and store the optical drive safely when it's not in use, you have backup and fault-tolerance in one operation.

Immunity is an inexpensive, easy way to bring fault tolerance and RAID Level 1 to your network. It's a good insurance policy against hard disk failure.

• List price: *Immunity, Version 2.0*, \$249. Requires: *220KRAM, DOS 3.3 or later, Microsoft Windows 3.0 or later for Windows interface*. *Unitrol Data Protection Systems Inc.*, 815 Hornby St., #604, Vancouver, B.C., Canada V6Z2E6; 800-665-2212, 604-681-3611; fax, 604-681-3615.

Circle 422 on reader service card



MIRROR, MIRROR: Immunity guards data.

So Much.

*True
600 x 600
laser output*

*Paper sizes up to
11" x 17"*

*Automatic
switching
for Mac
and PC*

*Superb CAD,
spreadsheet and
desktop publishing
output*

*PostScript[®], HPGL/2,
HP PCL5 language
compatible*

*Multiple RISC processors
improve total throughput*

*30-day money back
guarantee*

So Little.

 **\$3995**

So what else could you ask for?

Not much when CalComp's new CCL 600™ laser printer already includes letter and 11 x 17 paper sizes, the latest Canon-based laser engine with crisp 600 x 600 dpi resolution, concurrent Macintosh and PC connectivity, compatibility with PostScript, HPGL/2 and PCL5,

plus special processors for incredibly fast throughput.

So easy to buy, too. Just call CalComp Direct to order the new CCL 600 or to see a demonstration at your nearest CalComp dealer. You get a 30-day money back guarantee, 1-year warranty and CalComp's world class support, so why wait? Order now!

CALCOMPDIRECT

800-445-6515 Ext. 28

SALES TERMS: Prices are in United States dollars. With approved credit, standard terms are Net 30 from date of delivery. We also accept MasterCard/VISA (no surcharge), cashiers check and money orders. Prices do not include applicable sales tax or delivery charges and are subject to change without notice. Ordering hours 7:30 am to 4:30 pm PST. DELIVERY: In most cases products are shipped within 24 hours, surface; 1st or 2nd day air available. CalComp is not responsible for errors in typography. © 1992 CalComp. CCL 600 is a trademark of CalComp. PostScript is a registered trademark of Adobe Systems Inc. HPGL/2 and PCL5 are trademarks of Hewlett-Packard. Canon is a trademark of Canon Inc. CalComp, a Lockheed Company, is headquartered at 2411 West La Palma, Anaheim, CA 92801. FAX: 714-821-2714. From outside the U.S. and Canada, call 714-821-2000.



CIRCLE 028 ON READER SERVICE CARD

■ Diagnostic Software

WinSleuth Gold: Bargain Bundle of Tools

BY TONY POMPILI

In an effort to make looking under the Microsoft Windows hood a bit easier and more flexible, Dariana's newest version of its system diagnostic and testing software, WinSleuth Gold, Version 3.04 (\$169), includes an improved interface, expanded help, and built-in antivirus protection.

WinSleuth unravels the minute details of Windows, from the location of Windows and application code in memory to your system's configuration. The program also ties disparate Windows pieces into logical system reports. For example, the Ports tool displays the port name, its interrupt, and the Windows printer driver assigned to the physical port.

Without the cluttered interface that plagued previous versions, the new version has ten basic tool buttons such as Memory, System, Video, and Disk. Once you choose a general category, WinSleuth offers more detailed functions. The new interface makes it easy to locate and execute diagnostic and testing features in specific areas without having to hunt around.

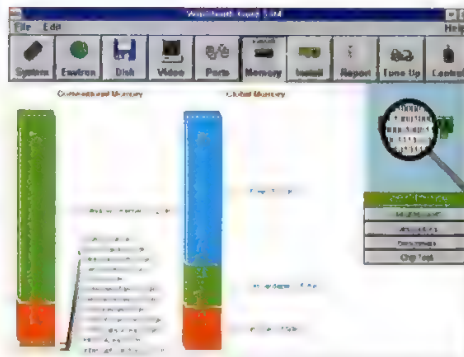
Although WinSleuth has a cleaner interface, much of the information is displayed in a fairly technical format that won't be terribly useful to the average user. For a technical troubleshooter, however, WinSleuth's strength lies in its ability to gather specific information about the current state of a system's Windows setup.

The basic system-configuration information WinSleuth provides didn't always prove accurate in testing. For example, the interrupt and DMA (direct memory access) display for hardware devices showed IRQ 12 to be available even though a

network adapter card was using interrupt 12.

WinSleuth's help isn't context-sensitive, but it does provide detailed explanations of the displayed data, which is organized logically in the same hierarchical manner as the application tools. Printing WinSleuth data is quick; there are a score of predefined reports.

Taking up about 2MB of hard disk space, WinSleuth comes with a few extras, includ-



PICTURE THIS: A WinSleuth memory map.

ing Dariana's original System Sleuth for DOS. Also bundled with WinSleuth are Triton Technologies' CO/Session (remote-access software) and Trend Micro Devices' PCSCAN and WinRX (which are antivirus

software utilities).

WinSleuth provides a wealth of Windows information in a generally well-organized presentation. The \$169 price makes it a bargain bundle for the Windows technical troubleshooter who needs to solve problems in both the DOS and Windows environments.

• List price: *WinSleuth Gold, Version 3.04*, \$169; upgrade, \$25.95. Requires: 3MB RAM, 2MB hard disk space, *Microsoft Windows 3.1*. Dariana Inc., 5241 Lincoln Ave., #B5, Cypress, CA 90630; 800-892-9950, 714-236-1380; fax, 714-236-1390.

Circle 432 on reader service card

■ Windows Utilities

Plug-In: A \$20 Face-Lift for The Program Manager

BY BARRY SIMON

Despite the seemingly endless list of Microsoft Windows Program Manager replacements that are available today, many Windows users have stuck with the plain old Program Manager. After all, it does the job.

But maybe you'd like to assign icons to your groups, or maybe you'd like to remove groups selectively to reduce clutter (but in a way that lets you recover them later). If so, you'll

want Plug-In for Program Manager, a \$20 shareware gem from Plannet Crafters.

Plug-In adds an extra menu to the Program Manager's menu bar and attaches several items to the menus there. The Change Icon item on the File menu will probably be a favorite because it lets you assign an icon to any individual group. No more boring folders! Another new feature, Groups, includes an item to restore the Program Manager window to its startup state.

Plug-In's Group Management feature keeps a list of activated and deactivated groups. The active groups are the ones currently displayed by the Program Manager. From the group-management dialog you can move a group from one list to the other or move many groups in batch mode. Deactivating groups is a way to avoid clutter in the Program Manager's window without losing the ability to access the groups you use rarely.

Plug-In provides a single-panel System Information dialog that includes a breakdown of memory usage by application. You can change the icon used when the Program Manager is minimized and even have the program display free resources and memory.

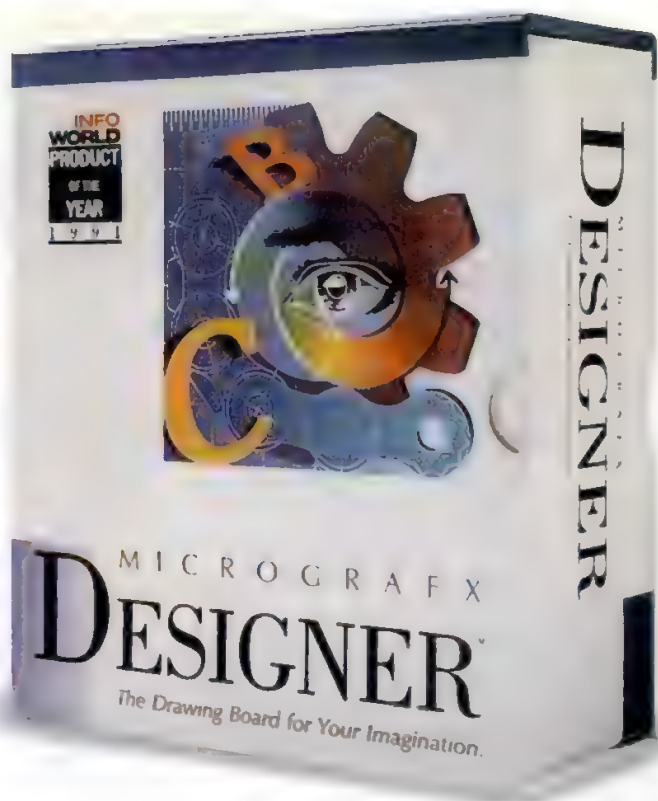
Other features include the ability to change the system and hourglass cursors, the ability to assign a hotkey to the Program Manager, a Save Settings Now menu item, and a Quick Run menu.

• List price: *Plug-In for Program Manager*, \$20 direct from company or available as shareware (PLUGIN.ZIP in ZiffNet's UtilForum). Requires: 2MB RAM, *Microsoft Windows 3.0* or later. Plannet Crafters, 2580 Runic Way, Alpharetta, GA 30202; 404-740-9821; fax, 404-740-1914.

Circle 426 on reader service card



PROGMAN CHANGES: Each group gets its own icon.



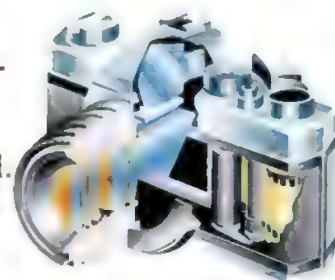
From practical to technical, we've got your OS/2 graphics solution.



From marketing maven to rocket scientist, we've got an award-winning graphics solution for every OS/2 user!

Easy-to-use Micrografx Draw™ for OS/2 lets business users add the power of dazzling graphics to reports, charts, newsletters, maps, invitations and more. You can do your own drawings, or choose from over 2,600 ready-made clip art illustrations. Finally, a complete drawing package for OS/2 that anyone can afford!

For precision illustration, Micrografx Designer™ for OS/2 simply has no equal. With an unmatched array of powerful drawing tools plus \$5,000 worth of OS/2 compatible type fonts built in, it's no wonder Designer is *InfoWorld's* "Product of the Year" for 1991, and *PC Magazine's* "Editor's Choice" for the third straight year.



No matter what you do, we have the OS/2 graphics solution that's right for you. Call today for more information. **30-day money-back guarantee! 1-800-578-1981**

M I C R O G R A F X ®



Whoever said you can't be in two places at once?

One look at Microcom® Carbon Copy™ and you'll wonder how you ever got along without it. From home or on the road, control your office PC or LAN to check your e-mail. Use an application not on your notebook PC. Support PC users in other locations. Just think about the time and cost savings. And that's not all. Retrieve forgotten files. Transfer files. Download a report. Access information services. With Carbon Copy, it's fast and easy. Carbon Copy for DOS combines modem and LAN communications in one package for one low price. It is, without doubt, the best value in remote control communications. To buy Carbon Copy for DOS or Windows visit your local dealer.

Or for the dealer nearest you, call Microcom at

1-800-822-8224.

And see just how easy it is to be in two places at once. Over 800,000 people already use Carbon Copy.

Right now, when you buy Carbon Copy for DOS, you'll get Virex® virus detection software FREE.

Offer good while supplies last.

Microcom's other PC connectivity products include: MicroPorte™ and QX™ high-speed portable and desktop modems, Relay® PC-to-mainframe communications software, Microcom Bridge/Router™ plug-and-play remote internetworking, and LANtard® for managing and supporting PCs on LANs.



microcom®

Microcom, Inc.
500 River Ridge Drive, Norwood, MA 02062-5028
(800) 822-8224; (617) 551-1000; Fax: (617) 551-1021
International Fax: (617) 551-1007

©Microcom, Inc. 1992. All rights reserved. Microcom, MNP, LANtard, Relay, and Virex are registered trademarks and Carbon Copy, Stand Alone, QX, and Microcom Bridge/Router are trademarks of Microcom Systems, Inc. Other trademarks referenced are the property of their respective owners.

CIRCLE 023 ON READER SERVICE CARD

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Emerson Andrew Torgan

IMPROVED

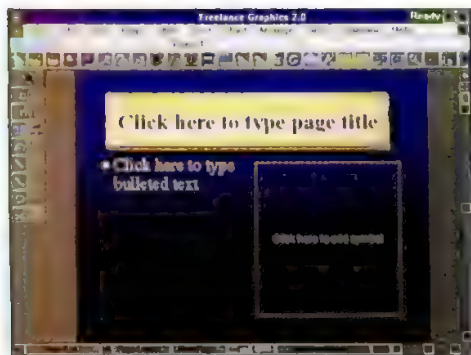
Lotus Updates Freelance Graphics for Windows

Lotus Development Corp. is shipping an update to its presentation graphics package. *Freelance Graphics for Windows*, Release 2.0, includes a wide range of new features, including an updated QuickStart tutorial, an animated product introduction with 5 hands-on exercises, 12 new SmartMaster presentation styles, new page layouts and chart types, organizational charts and text tables, and tighter integration with other Lotus applications. "Tips" buttons, preview capabilities, and browsing galleries are found throughout the program.

SmartMasters, which are fill-in-the-blank presentation styles, now have two new page layouts for organizational charts and tables, afford more flexibility in customizing each page, and include 12 additional SmartMaster designs. A new SmartShow screen has buttons for jumping to other pages, launching other applications, and playing sound or movie files. SmartShow offers 32 transitional effects, including animated transitions such as paintbrush, curtains, or flying text, for moving from page to page. It also offers on-screen drawing and a VCR-like control panel that gives presenters greater control over presentations. New support for multimedia gives you access to sound and animation within presentations.

- List price: *Freelance Graphics for Windows*, Release 2.0, standard edition (fully networkable) \$495; single-user *Lotus License Pack*, \$398; upgrade from previous versions or from competitive products, \$150. **Lotus Development Corp.**, Graphics Product Group, 161 First St., Cambridge, MA 02142; 800-343-5414, 617-577-8500; fax, 617-253-9150.

Circle 402 on reader service card



Freelance Graphics for Windows, Release 2.0.

HOT PROSPECT



The Z-Lite: 3.9-pounds, Backlit Display, 2 PCMCIA Slots

Zenith Data Systems has unveiled its first subnotebook, the 3.9-pound Z-Lite 320L, featuring two PCMCIA Version 2 slots. The unit, which is smaller than a standard sheet of paper at 1.5 by 9.9 by 7.6 inches (HWD), is based on Intel's 3.3-volt 20-MHz 386SL processor and offers between 3 and 6 hours of battery life, according to ZDS.

Unlike Dell's 3.6-pound 320SLi subnotebook, which has a 9.5-inch reflective screen that is not backlit, the Z-Lite 320L has a backlit 8.5-inch VGA display. This bright screen offers 64 shades of gray and 16-bit video processing for smooth cursor movement.

The base unit, the Model 60, ships with 2MB RAM, a 60MB hard disk, and DOS 5.0 preinstalled. The Model 60W ships in the same configuration, but adds an external floppy disk drive, Windows 3.1 preinstalled, and an Apple Powerbook-like detachable pointing device called the LitePoint, which places a trackball below the Spacebar. The Z-Lite 320L is the first subnotebook to ship with two PCMCIA slots, allowing to load your subnotebook up with everything from data/fax modems to wireless LAN adapters such as Proxim's RangeLAN/PCMCIA.

- List price: *Z-Lite 320L Model 60*, \$1,899; *Z-Lite 320L Model 60W*, \$2,199. **Zenith Data Systems**, 2150 E. Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331, 708-808-5000; fax, 800-472-7211.

Circle 401 on reader service card

IMPROVED

WordPerfect 5.2 for Windows Adds ATM, Grammatik 5

WordPerfect Corp.'s latest upgrade to its Windows-based word processor includes a number of new tools, and now ships with Adobe Type Manager (ATM) and Reference Software International's Grammatik 5 grammar checker. WordPerfect 5.2 for Windows also includes the new WordPerfect QuickFinder, an indexing and text retrieval feature, as well as e-mail capabilities, support for OLE (Object Linking and Embedding), and new macros such as Replace, Barcode, and Glossary.

Additional enhancements include a Quick-Menu with extra Button Bars and editing and setup options, better support for Windows printer drivers, and an envelope macro with options to select from multiple addresses and to position the POSTNET bar code.

- List price: *WordPerfect 5.2 for Windows: Upgrade kit with upgrade guide, disks, and documentation for Grammatik 5 and ATM*, \$39.95; full upgrade package with complete documentation, \$99. **WordPerfect Corp.**, 1555 N. Technology Way, Orem, UT 84057; 800-321-4566, 801-225-5000; fax, 801-222-5077.

Circle 403 on reader service card

NEW

Alacritry Unveils E-Quip for Windows for Workgroups

Alacritry Systems' E-Quip—Workgroup Imaging is a document imaging system specifically designed for Microsoft's Windows for Workgroups. The hardware/software solution provides every-desktop in a Windows for Workgroups network with a suite of office equipment, including a plain-paper fax machine, fax server, photocopier, and document image storage and retrieval system for paper and fax documents.

When using E-Quip—Workgroup Imaging, anything on paper can be stored on disk and shared among members of the workgroup; paper documents can be scanned, stored, compressed, indexed, viewed, and printed. Faxes can be received, distributed, stored, or printed on plain paper. An OCR application converts document images and faxes to editable word processing and spreadsheet files. A Finder

New & Improved

function performs full text searches of descriptions of scanned documents and faxes.

The five-station starter kit consists of application software, an ISA-compatible add-in card with a 50-MHz coprocessor and 6MB RAM, a fax server modem, a scanner interface, and a high-speed printer interface.

• List price: *E-Quip—Workgroup Imaging: Five-station starter kit*, \$2,995; *five-user license package*, \$995. *Alacrity Systems Inc.*, 43 Newburg Rd., Hackensack, NJ 07840; 908-813-2400; fax, 908-813-2490.

Circle 404 on reader service card

NEW

Address Express Handles Envelopes, Prints Bar Codes

CoStar Corp. is offering Address Express, which combines an ink jet printer designed to handle envelopes, postcards, cut-sheet labels, and self-mailers with addressing software for DOS, Windows, and the Macintosh. The system can be used as a standalone solution or can be shared on a network. The optional network interface supports NetWare 2.x and 3.x, Artisoft LANtastic, and AppleTalk.

The DOS software installs as a TSR and pops up over programs to print envelopes at any time. Addresses can be typed or captured from the screen. The Windows software includes its own print driver for printing directly from any Windows application. Both provide mailing-list management features. Address Express can also be set to print the matching POSTNET bar code for any U.S. ZIP code.

• List price: *Address Express*, \$795; *DOS Network pack with 10-user site license*, \$349; *Windows Network pack with 10-user site license*, \$349; *AppleTalk Network Interface*, \$199; *Macintosh 5-user site license*, \$149. *CoStar Corp.*, 100 Field Point Rd., Greenwich, CT 06830; 203-661-9700; fax, 203-661-1540.

Circle 405 on reader service card

NEW

Canyon Action! QuickTime Movies for Windows

The San Francisco Canyon Co. is shipping Canyon Action!, a collection of over 50 full-motion sound and video clips on CD-ROM for QuickTime Movies for Windows. Canyon Action! includes Apple Computer's Movie Player for Windows, QuickTime DLLs, and a Windows Picture Viewer.

The CD-ROM disk contains four categories of movie clips that can be played directly from the CD-ROM or copied to the hard disk. A fifth

BRIEFS

PIMS, SCHEDULERS, AND CONTACT MANAGERS

Blue Cannon Software's Calendar Wise, Version 1.1 (\$29.99) is an on-screen calendar that simulates a desktop blotter. The format can be defined to allow viewing of multiple weeks at one time, and up to 100 separate calendars can be stored. 800-779-0850; fax, 704-398-0928.

CE Software Holdings' Calendar-Maker, Version 4.0 (\$79.95), has the ability to generate calendars in several WYSIWYG layouts, including day, week, two-week, month, and year. The new version provides increased control over calendar headings, borders, and colors. 515-224-1995; fax, 515-224-1721.

Contact Software International is shipping 1stACT! for Windows (\$149), its entry-level contact management package. The software integrates a contact database, activity manager, a word processor with mail-merge capabilities, a report generator, and an auto-dialer. 214-919-9500; fax, 214-919-9750.

Follow-Up Software's contact management package, Follow-Up, Version 6.0 (\$399.95), now ships with a complete quoting and order entry system, customizable reports, improved import features, and automatic distribution of new sales leads. A network version is also available (\$995). 216-589-5788; fax, 216-589-5727.

Individual Software's new AnyTime (\$59.95) provides a set of daily, weekly, monthly, and yearly calendar layouts that can be printed to full-size, organizer, and pocket-size paper. 800-822-3522.

Profile Technologies' INFOtrac, Version 2.0 (\$349), contact management software now includes SAA/CUA compliant menus, and an "Improved Sales Forecasting" module that functions by account. A new "Order Entry" module prints quotes, invoices, sales orders, and packing slips. INFOtrac integrates into CAI's AccPac Plus Accounting software. 603-434-6165; fax, 603-437-2261.



Canyon Action! has full-motion video clips.

category contains still pictures. Movies normally play at 12 to 15 frames per second in a 3-inch on-screen rectangle. The rectangle is resizable to fill the screen, but increasing the size affects performance. A movie controller bar located at the bottom of the rectangle controls most movie play functions, although many operations can be executed from the keyboard or from menu items.

• List price: *Canyon Action!*, \$89.95. *The San Francisco Canyon Co.*, 300 Montgomery St., #789, San Francisco, CA 94104; 800-227-1817, 415-398-9957; fax, 415-398-5998.

Circle 406 on reader service card

NEW

AirLAN: External Wireless Network Adapter for PCs

Solectek Corp. has introduced AirLAN, a wireless network adapter that attaches to the parallel port of any PC, making mobile and temporary LAN connections possible without adding network nodes. AirLAN plugs into any parallel port, including the new high-speed Enhanced Parallel Port (EPP), and provides a pass-through multiplexer for printer connection. The installation software automatically recognizes the type of port and guides you through the network configuration process. A green LED link indicator lets you know when connection is established.

AirLAN was jointly developed with NCR Corp. using its spread spectrum technology, which uses radio frequency waves to transmit data at a rate of 2MB per second at a maximum distance of 800 feet. The unit complies with most networking standards, IEEE 802.3, and is compatible with a number of host-based and peer-to-peer network operating systems such as Novell's NetWare and NetWare Lite, and Banyan's VINES.

• List price: *AirLAN*, \$899. *Solectek Corp.*, 6370 Nancy Ridge Dr., San Diego, CA 92121; 800-437-1518, 619-450-1220; fax, 619-457-2681.

Circle 407 on reader service card

STATISTICA/W

Windows
DOS, Macintosh

STATISTICA/W™ (for Windows) Complete Statistical System with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Complete Windows 3.1 support, DDE, OLE, TT-fonts, multiple toolbars, right mouse button support ■ Unlimited numbers of data-, results-, and graph-windows ■ Inter-window integration: data, results, and graphs can be treated as objects and converted into one another in a number of ways ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques; multi-way tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; time series modeling; forecasting; lags analysis; quality control; process analysis; experimental design (with Taguchi); and much more ■ Manuals with hypertext-based Stats Advisor expert system ■ Extensive data management facilities (spreadsheet with long formulas, block operations, advanced Clipboard support, DDE hot links, relational merge, data verification, powerful programming language) ■ Batch command language and macros also supported, "turn-key system" options ■ All output displayed in Scrollsheets™ (dynamic, customizable, presentation-quality tables with toolbars, pop-up windows, and instant 2D, 3D and multiple graphs) ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megabyte Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE or an extensive selection of file import/export facilities ■ Hundreds of types of graphs, including categorized multiple 2D and 3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom design new graphs and add them permanently to menu ■ On-screen graph customization with advanced drawing tools, interactive stretching and resizing of complex objects, interactive embedding of graphs and artwork, special effects, icons, maps, multi-graphics management, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of all 3D and 4D graphs ■ Extensive selection of tools for graphical exploration of data: fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price \$995.

Quick STATISTICA/W™ (for Windows) A comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/W ■ Price \$495.

STATISTICA/DOS™ (for DOS) A STATISTICA/W-compatible data analysis system ■ Price \$795.

Quick STATISTICA/DOS™ (for DOS) A subset of STATISTICA/DOS statistics and graphics ■ Price \$295.

Domestic sh/h \$10 per product; 14-day money back guarantee.

CIRCLE 057 ON READER SERVICE CARD

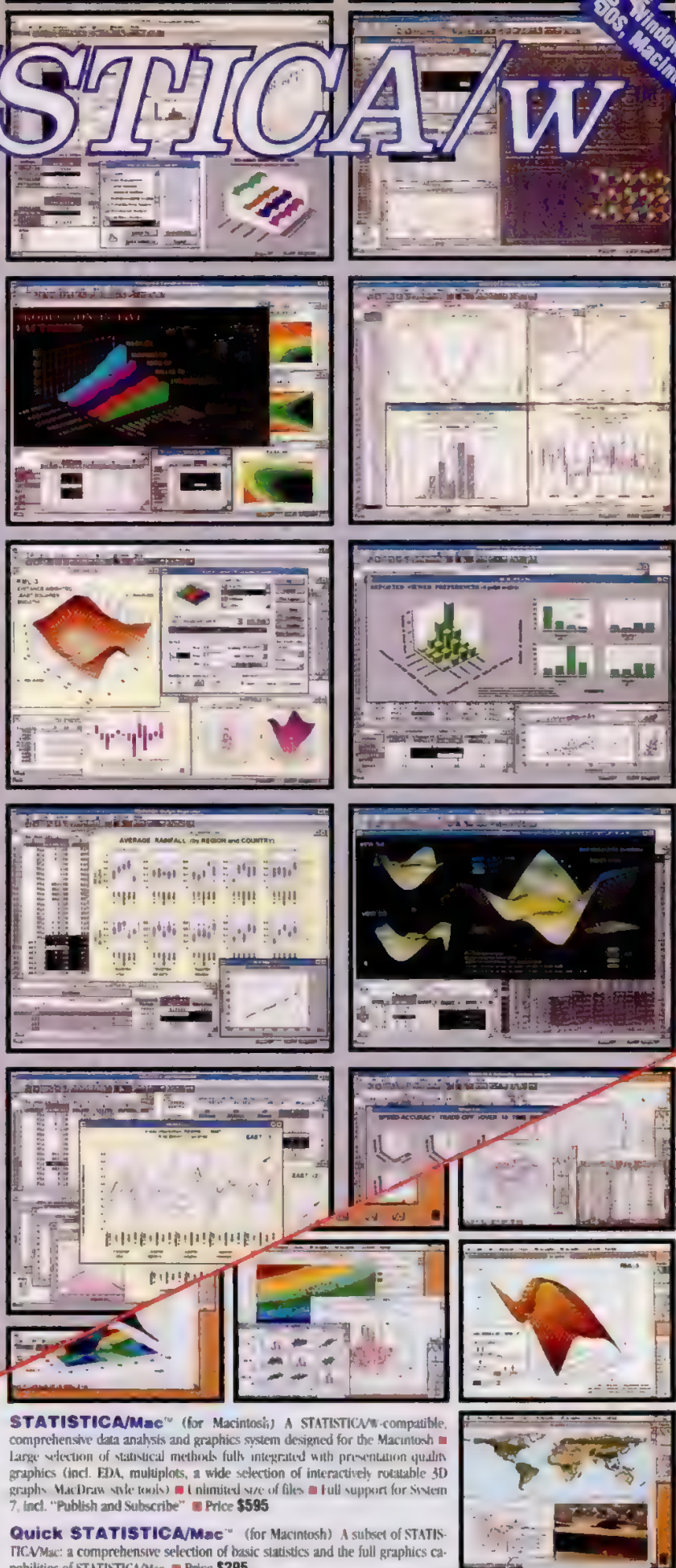


StatSoft™

2325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149
Fax: (918) 583-4376

Overseas Offices: Statsoft of Europe (Hamburg FRG) ph 040 4200347, fax: 040 4911310; StatSoft UK (London, UK), ph 0462 482822, fax: 0462 482855; StatSoft Pacific (Melbourne, Australia) ph (03) 663 6580, fax: (03) 663 6117; StatSoft Canada-CCO (Ontario) ph 416 849-0737, fax 416 849-0918. Available From: CORPORATE SOFTWARE and other Authorized Representatives Worldwide. Holland: MAB Juisling, 071-230410, France: Version US (1), 40590913, Sweden: Akademik Data 018 240035, Hungary: Dagent Kft 186 5782, Belgium: TEXMA 10 61 16 28, South Africa: Osiris 12 663 4500, Japan (Macintosh): Three's Company, Inc., 03-3770-7600, Japan (DOS and Windows) Design Technologies, Inc., 03-3667-1110

StatSoft, STATISTICA/W, Quick STATISTICA/W, STATISTICA/Mac, Quick STATISTICA/Mac, STATISTICA/DOS, Quick STATISTICA/DOS and Scrollsheet are trademarks of StatSoft, Inc.



STATISTICA/Mac™ (for Macintosh) A STATISTICA/W-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs, MacDraw style tools) ■ Unlimited size of files ■ Full support for System 7, incl. "Publish and Subscribe" ■ Price \$595

Quick STATISTICA/Mac™ (for Macintosh) A subset of STATISTICA/Mac: a comprehensive selection of basic statistics and the full graphics capabilities of STATISTICA/Mac ■ Price \$295

IF YOU WANT TO KNOW ABOUT PORTABLES,



**MAYDAY!
MAYDAY!
MAYDAY!**

**IN THE WORLD'S FIRST TRANSATLANTIC
BALLOON RACE, THE COMPUADD 325TX
CAME TO THE RESCUE!**

On September 16, 1992 the world's first transatlantic balloon race started in Bangor, Maine. Each balloon carried a CompuAdd 325TX notebook to link it by satellite to the race control center, provide the crews with the shortest route-to-landfall information and allow them to send messages. But the most critical mission these CompuAdd portables performed was aboard two balloons that went down in the ocean. Dripping wet and badly beaten up, the CompuAdd 325TX notebooks continued to relay their positions — speeding the rescue effort. “The crews would have had no other means of communicating their position,” said Race Director Alan Noble. But the CompuAdd 325TXs, “kept on working when they were soaked in seawater ...despite being tossed around and seriously abused.”

COMPUADD 325TX: RUGGED, DEPENDABLE, AFFORDABLE!

Built-in trackball
Low power for longer battery life
6.16 pounds, 11.3" x 8.5"
386SXL 25MHz processor
80387 coprocessor socket
2MB DRAM expandable to 8MB
Built-in 3.5" disk drive
640 x 480 VGA resolution with 64 gray scale
80MB hard drive loaded with MS-DOS 5.0 and Windows 3.1
120MB available for \$1795

**325TX
NOTEBOOK
\$1595**

CompuAdd®
CUSTOMER DRIVEN, BY DESIGN.

1-800-289-9888

KEY CODE 816

ASK THE WORLD'S LIGHTWEIGHT EXPERTS.

COMPUADD'S NEW 425C
BRINGS YOU THE LATEST
INNOVATION IN NOTEBOOKS — **COLOR!**

For the same price other computer companies are charging for a monochrome notebook, CompuAdd brings you 486 power and color — all in a 7 pound package. The CompuAdd 425C color notebook comes with a math coprocessor built in, a full four megabytes of DRAM and SIMULSCAN support so you can run full color presentations on the LCD and a monitor at the same time. You also get a built-in trackball, an automatic sleep key and Microsoft's APM (Advanced Power Management) for longer battery life in DOS and Windows. Plus a unique System Status Window that shows battery level, power management status, modem ring status and more! Choose from an 80MB or 120MB hard drive — either way it's pre-loaded with MS-DOS 5.0 and CompuAdd Windows 3.1 so you're ready to go!

COMPUADD 425C: POWERFUL, PORTABLE, COLORFUL!

Cyrix 486SLC processor rated at 25MHz

4MB DRAM expandable to 8MB

80387SX Cyrix math coprocessor built-in

VGA color LCD 8.5" diagonal screen (640x480)

3.5" 1.44MB floppy

1 parallel, 1 serial, external keyboard and VGA ports

Built-in trackball

82-key keyboard emulates 101-key layout

11.6" x 8.2" x 1.8"

Travel weight under 7 pounds

Optional 2400 baud modem with 9600 baud send/receive fax modem

80MB IDE hard drive (120MB available for \$2795)

425C
NOTEBOOK
\$2595

CompuAdd

CUSTOMER DRIVEN, BY DESIGN.

1-800-289-9888

KEY CODE 816

IRCLE 126 ON READER SERVICE CARD

New & Improved

NEW

Command Center Windows Utility Arrives on the Launch Pad

Artist Graphics is shipping **Command Center**, Version 1.0, a Windows utility that offers pop-up menus and point-and-click access to Windows application commands. The program lets you assign any application command to a text-based button on an application-specific **Command Center** pad—a pop-up menu invoked by clicking the right mouse button. If you switch to another app, a new **Command** pad will appear that is specific to that application.

Command pads are created via a point-and-click mouse operation. The number and size of **Command** pad buttons are user-definable, and there is an option for application scroll bars. A keyboard toggle allows Microsoft Excel and other applications that use the right mouse button to bypass **Command Center**. It ships with sample **Command** pads for Microsoft Word for Windows and other Windows applications.

- List price: *Command Center, Version 1.0*, \$49.95. **Artist Graphics**, a **Control Systems Co.**, 2675 Patton Rd., St. Paul, MN 55113; 800-627-8478, 612-631-7800; fax, 612-631-7802.

Circle 408 on reader service card

NEW

Toshiba CD-ROM Drives Promise To Double Performance

Toshiba America Information Systems, Disk Products Division, has introduced the **XM-3401 Series**, a new family of CD-ROM drives that provides twice the performance of standard drives, according to the company. The **XM-3401 Series** provides data transfer rates of 330 kilobytes per second and a random access time of 200 milliseconds. The access time is achieved via a proprietary high-differential servo mechanism, a new low-mass optical pick-up head, and a high-torque brushless spindle motor.

Available in both internal and external configurations (including the **TXM-3401P** designed for notebook computers), the **XM-3401 Series** ranges in price from \$695 for the internal **XM-3401B** to \$3,575 for the **TXM-3401A4**, a four-drive model. The units are compatible with Eastman Kodak's **Photo CD**.

- List price: *XM-3401B (internal model)*, \$695; *TXM-3401E (external model)*, \$895; *TXM-3401P (notebook model)*, \$925; *TXM-3401A4*, \$3,575. **Toshiba America Information Systems Inc.**, **Disk Products Division**, 9740 Irvine Blvd., Irvine, CA 92713; 714-583-3111.

Circle 409 on reader service card

BRIEFS

PIMS, SCHEDULERS, AND CONTACT MANAGERS

PRS Software's **Personal Reminder System**, Version 2.0, is now available, shipping in both standard (\$89.95) and professional (\$159.95) versions. The standard version provides dozens of features such as calendar, text, and category displays; an appointment book with meetings scheduled in either 15- or 30 minute increments; and memory-resident alarms. The professional version offers all the same features, with the addition of interactive scheduling, support for EMS memory, and the ability to hold 50 separate schedules. 908-272-2827.

Scott Business Computers' Timepoint, Version 2.3 (\$895 for the base module), is software designed for scheduling employees on shifts. The new version features an improved auto-scheduler, enhanced rotation patterns, and improved printing capabilities. The LAN upgrade offers a new departmental menu that allows up to 99 different departments to be scheduled. 800-875-6617.

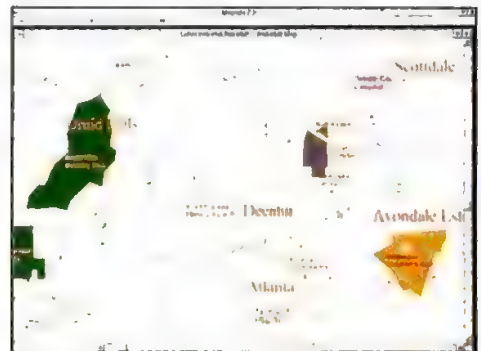
Portfolio Software is shipping a Windows version of its address book software package for the Macintosh. **Dynodex for Windows**, Version 1.0, prints address books for personal organizers such as the **Day-Timer** series. The preformatted entry screen contains 22 user-definable fields and offers **WYSIWYG** display. 408-252-0420; fax, 408-252-0440.

Power Up Software is shipping two new versions of **Calendar Creator**. **Plus: Calendar Creator Plus 1.0** for Windows (\$79.95), and **Calendar Creator Plus 5.0** for DOS (\$69.95). **Calendar Creator Plus 1.0** for Windows contains the same library of daily, weekly, monthly, and annual formats found in the DOS version, and also offers weekly schedules with time slots, two page spreads, multiple calendars on a single page, and calendar text listings. **Calendar Creator Plus 5.0** for DOS now lets you print calendars as pocket-sized "InstaBooks," and also supports double-sided printing, new paper sizes, and PostScript printing. 415-345-5900.

IMPROVED

StreetInfo 2.0 Provides Five Separate Layers of Detail

MapInfo Corp., makers of **MapInfo** for Windows, is shipping **StreetInfo**, Version 2.0, a new data file for street-level maps of the United States that is compatible with **MapInfo's** GUI desktop mapping product line. Derived from 1990 post-census data, the files detail streets and town boundaries and provide information about airports, hospitals, libraries, parks, cemeteries, schools, and historical and public landmarks. It also has new line types and colors for different classes of roads, and new symbols and



StreetInfo 2.0 provides street-level map files.

color-shaded areas depicting town and city boundaries, parks, and waterways.

StreetInfo maps are compiled and are available by county or by state, or you can get the entire country. Each county file contains five separate geographical layers: streets and railroads, city and town boundaries, point landmarks, area landmarks, and waterways. All five layers can be displayed at once or shown separately, or can be shown in any combination. The new version also includes local names or "aliases" for state highways and major roads, so if Route 3 is known as "Memorial Drive," both designations are recognized.

- List price: *StreetInfo 2.0*, \$225 per county; current *StreetInfo* users may upgrade their files for \$67.50 per county. **MapInfo Corp.**, 200 Broadway, Troy, NY 12180; 800-327-8627, 518-274-6000; fax, 518-274-6066.

Circle 410 on reader service card

IMPROVED

CA Upgrades CA-SuperProject For Windows and CA-Clipper

Computer Associates International's project management software, **CA-SuperProject** for Windows, Version 3.0, has new user interface enhancements, context-

BI-DIRECTIONAL TRANSLATION

THE LANGUAGE ASSISTANT SERIES VERSION 5



With the new Language Assistant Series - - *Spanish Assistant, French Assistant, German Assistant and Italian Assistant* - - you get sentence-by-sentence translation in both directions - from English to the foreign language, and vice versa!

The Language Assistant translates words, searches for phrases, conjugates verbs, provides gender and number agreement, and works with word order.

It can help you decipher foreign documents and produce understandable foreign translations. The dictionaries have been enhanced and enlarged to include more usage information and to recognize over 100,000 terms. The on-line reference tools, grammar help and foreign character utility provide instant help when translating, writing or studying.

Version 5 availability: Spanish 10/92,
French 11/92, German 12/92, Italian 2/93
CIRCLE 013 ON READER SERVICE CARD

Only \$99.95 - Order Now!

For bi-directional translation power, nothing tops the new Language Assistant Series.

Order your copy today!

**See Your Software Dealer
Or Call (800) 366-4170**



MICROTAC SOFTWARE

4655 Cass St., Suite 214 • San Diego, CA 92109
(800) 366-4170 • (619) 272-5700
Fax: (619) 272-9734

sensitive pop-up forms, Windows 3.1-specific style improvements, and on-screen fonts. It also ships with a subset of CA-Realizer (an application providing charting, graphics, and form edition tools that can be integrated into applications written for CA-SuperProject) as the common macro language. A new "Project Manager's Assistant," a CA-Realizer application, forms the basis of an interactive and procedural help system that guides you through the creation, analysis, and reporting of a project. Also new to CA-SuperProject is support for DDE (Dynamic Data Exchange), DLLs (Dynamic Link Libraries) for Microsoft C and Microsoft Visual Basic, user-defined fields and formulas, new scheduling and resource management options, and new page format options.

CA has also unveiled CA-Clipper, Version 5.2, the Xbase application development system for DOS developed by Nantucket Corp., a company that Computer Associates recently acquired. CA-Clipper 5.2 has new Replaceable Database Drivers (RDDs), including an NTX driver for high-speed locking and conditional indexing; an MDX driver for dBASE IV, which supports multitag and conditional indexes; and FoxPro and Paradox drivers. It also has upgraded EMS support that includes LIM 4.0 compliance and improved EMS access. It features improved screen display performance and is RSIS (Relocatable Screen Interface Specification) compliant.

- List price: *CA-SuperProject for Windows, Version 3.0*, \$895; each additional *Lan Pak*, \$695; upgrade from previous version, \$295.

- List price: *CA-Clipper, Version 5.2*, \$795; \$149 to registered CA-Clipper developers. *Computer Associates International Inc., One Computer Associates Plaza, Islandia, NY 11788; 800-225-5224, 516-342-5224; fax, 516-342-5329.* Circle 411 on reader service card

IMPROVED

Outside In Gains Support for Graphic and Compressed Files

Systems Compatibility Corp. is shipping *Outside In for Windows, Version 2.0*, the company's file-viewing and data-import utility. The new version offers support for graphical and compressed files and provides basic file management features. The program can also be integrated into Windows-based e-mail programs to view attachments to messages.

New file formats supported by *Outside In for Windows* include .BMP, EPS, .GIF, TIFF, and .WPG, as well as CorelDRAW, Micrografx, Fax Group 3, and .ZIP file formats. The program now recognizes and displays more than 120 file types from DOS, Windows, Macintosh, DEC, and Wang applications. New graph-

BRIEFS

STATISTICS, CHARTING, AND GRAPHING

BioSoft is shipping *UnGraph, Version 2.0* (\$399), a software-only solution to x,y digitizing that replaces mechanical digitizing tablets using the output of hand-held and flatbed scanners. The update offers a number of new features and enhancements, including a single-point digitizer and a multiple line facility, as well as an improved line follower and gap-jumping algorithm. 314-524-8029; fax, 314-524-8129

Golden Software is shipping *Grapher for Windows* (\$199) a 2-D scientific graphics package that supports 32,000 data points per curve, and offers a worksheet that automatically computes statistics, sorts data, and performs mathematical transformations between worksheet columns. *Grapher for Windows* plots an unlimited number of curves and curve fits on each graph.

Polysoft's *TechPlot* (\$449) is a technical plotting and data processing package for DOS that offers pull-down menus, multiple windows, mouse support and an on-line help system. The software has a data sheet that performs statistical analysis, data transformation, digital signal processing, nonlinear parameter fitting, and model development. It has a variety of plot types, including two-dimensional and three-dimensional scatter plots, curve graphs and quality control charts. 801-485-0466; fax, 801-485-0480

Quinn-Curtis has unveiled *Windows Charting Tools* (\$400; \$800 with complete source code to the Quinn-Curtis Charting DLL) for Microsoft C/C++ and Borland C++ programmers. *Windows Charting Tools* is a collection of general purpose graphics and user interface routines for common charting problems encountered in scientific, engineering, and business charting. The software is a collection of C functions that let you create a variety of chart types, including line plots, area plots, bar graphs, pie charts, and open-high low-close plots. 617-449-6155

ics viewers let you view and print all or part of a file, and graphics can be copied to the Windows Clipboard. The ZIP viewer lists the contents of an archive file and can display any compressed file. The program lets you view and use any e-mail attachment without launching the application of origin. It integrates directly with cc:Mail, Microsoft Mail, WordPerfect Office, and DaVinci eMail, and can be used as a standalone utility with other Windows-based e-mail programs. File management capabilities include copy, move, rename, and delete. *Outside In for Windows, Version 2.0*, has improved Clipboard support for typefaces and line spacing, and supports all major Clipboard formats, including RTF, WordStar, and Lotus's Ami Pro.

- List price: *Outside In for Windows, Version 2.0*, \$89; free upgrade to all registered users of *Version 1.0*. *Systems Compatibility Corp., 401 N. Wabash, #600, Chicago, IL 60611; 800-333-1395, 312-329-0700; fax, 312-670-0820.*

Circle 413 on reader service card

NEW

Logicode Ships Pocket Version Of Quicktel Modem

Logicode Technology, known for the distinctive wedge shape (the Xeba enclosure) of its external Quicktel modems, is now shipping a pocket version. The *Quicktel 9624LP* external modem combines a 2,400-bps data modem that supports V.42 error correction and MNP 5 with 9,600-bps send/4,800-bps receive fax transmission capabilities. It has an internal battery that provides the initial power to establish connection, then it uses power from the phone line and serial port to maintain operation and keep the battery charged.

The *9624LP*, at 8 ounces, is about the size of a deck of cards. In addition to the software-supplied V.42 and V.42bis protocols, the unit supports MNP levels 2 through 5, V.22bis, V.22, Bell 212A, Bell 103, and is fully compatible with all Group III fax machines and the Hayes AT command set. The modem ships with BitCom and BitFax, STF, and WinFax communications software, and a DB25-to-DB9 converter.

- List price: *Quicktel 9624LP external modem*, \$299. *Logicode Technology Inc., 1380 Flynn Rd., Camarillo, CA 91320; 805-388-9000; fax, 805-388-8991.*

Circle 414 on reader service card



The 9624LP has the distinctive Xeba look.

The World's Tallest Cactus, Deepest Canyon and now... the Largest OS/2 Conference. No wonder Arizona's so hot.

*The OS/2 Technical Interchange
Introducing IBM LAN Systems
February 28-March 3
Pointe Hilton at South Mountain
Phoenix, Arizona*

THE LARGEST GATHERING EVER

For three days, software professionals from around the world will gather in Phoenix, Arizona, to exchange ideas and explore the potential of OS/2®, the computing environment that experts are calling the winning software platform for the '90s.

This is the Technical Interchange that's an absolute must for software designers, independent programmers, LAN experts, MIS managers, technical coordinators, corporate developers, consultants and training executives.

INTERACTIVE SESSIONS WITH THE INDUSTRY'S LEADING PROFESSIONALS

You'll participate in interactive sessions with senior designers from IBM, top industry experts, Borland, Lotus Development and Computer Associates. They'll share the latest breakthroughs covering everything from 32-bit graphics, object-oriented programming, LAN systems and client/server issues to multimedia and database applications. You'll learn powerful new programming skills and discover new ways to exploit the vast capabilities of OS/2 technology.

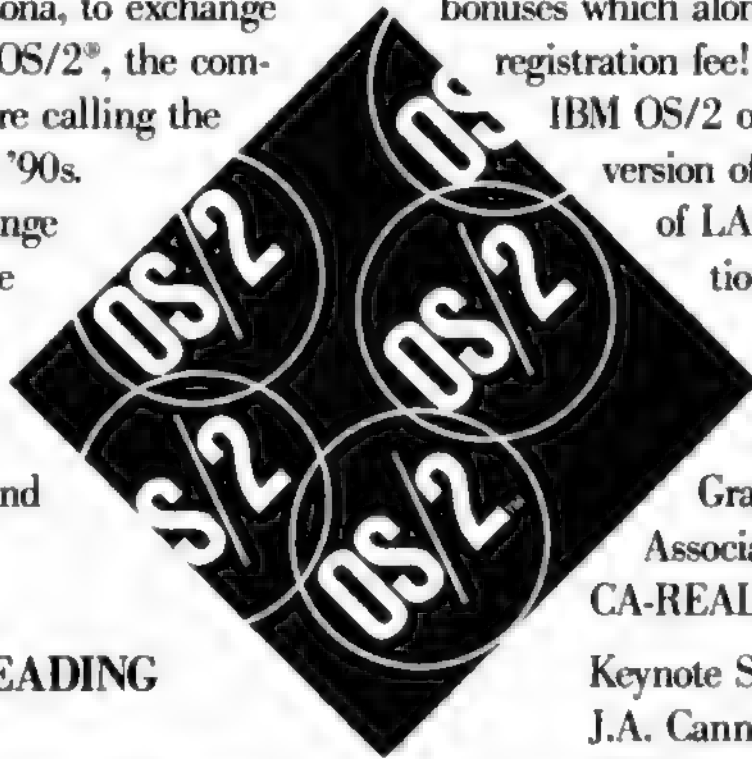
VALUABLE FREE SOFTWARE

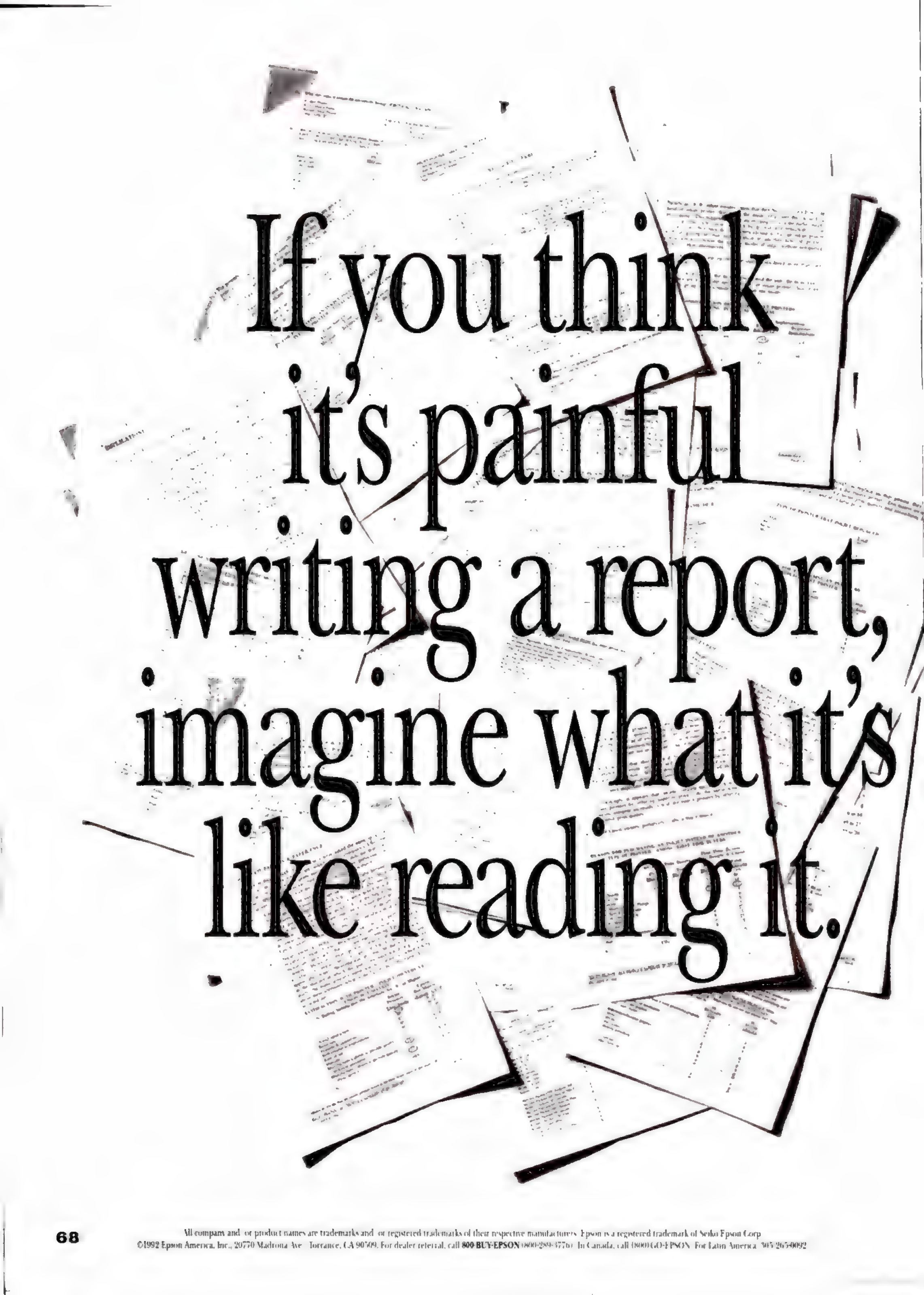
Every OS/2 Technical Interchange attendee will receive bonuses which alone are worth more than the registration fee! You will receive a beta version of IBM OS/2 or the latest available version, beta version of IBM C++ Set/2, an assortment of LAN software, and IBM Communications Manager.

Other fantastic bonuses include Lotus Development Corporation's functional and versatile Freelance Graphics software, and from Computer Associates, every attendee will receive CA-REALIZER for OS/2.

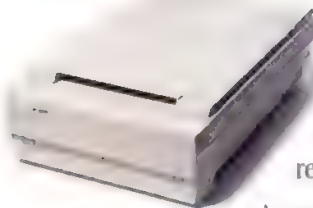
Keynote Speaker:
J.A. Cannavino
IBM Senior V.P. & General Manager,
IBM Personal Systems

Registration Fee: \$695.00
Call 1-800-438-6720 or
1-203-261-6227 to register today.
Space is limited.





If you think
it's painful
writing a report,
imagine what it's
like reading it.



No matter what type of document you're writing, Epson® has something that could benefit you as well as your

readers. The Epson Color Scanner.

A tool that easily could've been named the Epson "Add A Picture and Some Interest To Your Documents" Machine.

The rationale behind using one is simple. People like pictures. In fact, probably more than words. And besides being pleasing to look at, pictures often communicate faster than words, which means your audience will grasp your message more quickly, too.

What's unique about Epson scanners is that they come with more than the prerequisite wires and cables. For starters, you get a full version of the best software around: Micrografx® Picture Publisher® 3.1. Then we toss in a Caere® OmniPage® Direct OCR TryPack to help you scan in text. And whether you pick our 600C or 800C scanner, you get 24-bit single pass color scanning with almost 17 million colors.

Epson also offers handy add-ons, like a transparency unit for scanning slides, or an auto-document feeder to cut down on all of that time-consuming lid lifting. And, as always, we give a one year warranty. Not that you'll need it given the way we make things around here, but just so you know we're there if you need us.

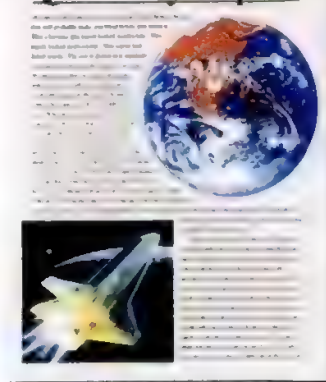
So why not look into an Epson Color Scanner for your office? After all, it couldn't hurt to test one out. And besides, your clients would probably really appreciate it.

Quarterly Report



Before.

Quarterly Report



After.



Want to learn more about scanners? Call 1-800-289-3776 and ask for representative 83 and we'll send you our free booklet.

EPSON®



Desktops



Scanners



Dot Matrix



Lasers

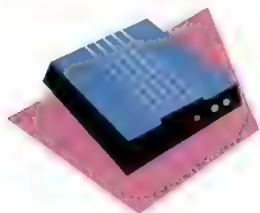


Notebooks

It's a FAX.



Never before has a single board communicated in so many ways. Yet, despite all its sophistication, the TyIN 2000 board is easy to install.



It's a MODEM.

And because it comes with a Windows-based user interface, it's even easier to use. With just one phone line, it automatically switches

It's VOICE MAIL.



between fax, modem and voice mail. Plus, it's the first board to offer a built-in audio recorder, so now you can attach recorded messages



It's a RECORDER.

to documents—including the ones you plan to fax. And it even guarantees true background operation, without tying up your PC.

It's a DEAL.



But best of all is its low price and limited 30-day money-back guarantee.

So don't delay, call today.

For the dealer nearest you, call 1-800-628-7364, Ext. 2000

TyIN²⁰⁰⁰[™]

PC COMMUNICATIONS CENTER



The TyIN 2000 board requires an AT-compatible system. *Manufacturer's suggested retail price (actual prices may vary). See your nearest dealer for details on our 30-day money-back guarantee. This limited offer expires May 31, 1993. TyIN and TyIN 2000 are trademarks of National Semiconductor Corporation. Windows is a trademark of Microsoft Corporation. ©1993 National Semiconductor Corporation.

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Carol Levin

Traveling the Internet

BY BRENT HESLOP
AND DAVID ANGELL

The Internet is the mother of all networks. It's a huge information superhighway that connects more than 5,000 networks and is used by five to ten million people worldwide. Many PC users know little about this global web, which mushroomed from its early military-industrial roots into a system open to any PC user. For the uninitiated, tapping into its vast grid of information and communication services can be a bumpy ride. Here are two new guides to get you started.

A highly respected Internet guru, Ed Krol is best known for his classic on-line documentation, *The Hitchhiker's Guide to the Internet*. Krol's new hands-on guide, *The Whole Internet User's Guide & Catalog*, is aimed at users new to the Internet and at those looking for tips on better navigation.

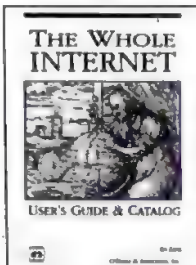
Taking a behind-the-wheel approach, he lays out the complex structure and rich history of the Internet and instills politically correct behavior in the chapter on Internet ethics. You don't need to know Unix, but it helps if you do since the commands for transferring files, sending e-mail (one of the most useful features), and getting news are standard Unix commands. Krol adequately explains to the PC user how to use the Telnet program to log onto a computer connected to the Internet, how to use the FTP (File Transfer Protocol) pro-

gram to transfer files, and how to send e-mail using a Unix program. You'll also learn to use the fragmented white pages system, read network news, post articles, and use four timesaving programs that hunt down resources on the Internet: Archie, Gopher, WAIS (Wide Area Information Servers), and WWW (World Wide Web).

Unfortunately, the assumption that all readers have a full-fledged Internet connection will leave PC users who access the Internet from a dial-up or on-line service stalled in the chapter on WAIS.

In addition to the standard programs, the guide covers a collection of supplementary ones, including remote commands, X windows, and games. The short but useful catalog section directs the Internet traveler to diverse networks, from aeronautics to zymurgy. The new Internet user will undoubtedly scour these pages for sites to visit, such as the Simpson's Archive or the CIA World Factbook. While dial-up and on-line service users could use more help than the guide offers, *The Whole Internet User's Guide & Catalog* is still the most comprehensive, up-to-date hands-on guide for cruising the Internet.

Also delivering a good understanding of the Internet terrain, *The Internet Companion* is an armchair travel guide that describes essential Internet concepts, terminology, and



■ International Connections

"The Internet has been an international network for a long time, but it only extended to the United States' allies and overseas military bases. Now, with the less paranoid world environment, the Internet is spreading everywhere. It's currently in over 40 countries, and the number is rapidly increasing. Eastern European countries longing for Western scientific ties have wanted to participate for a long time, but were excluded by government regulation. This ban has been relaxed. Third world countries that formerly didn't have the means to participate now view the Internet as a way to raise their education and technology levels.

The ability of the Internet to speak OSI protocols should help the Internet to expand into more countries. . . most of Europe regards IP as a cultural threat akin to EuroDisney. Networks based on the OSI protocols are much more palatable for them. If the two protocols could co-exist, everyone would be happy." □

—from *The Whole Internet User's Guide and Catalog*

tools in a concise, easy-to-follow, and anecdotal style—qualities that Internet supporter and vice president Al Gore addresses in the foreword.

Authors Tracy LaQuey and Jeanne C. Ryer begin by defining the Internet, exploring its history and participants, and explaining how it works and what resources it offers. An overview of the three basic Internet tools follows this: e-mail, remote login, and file transfer. The authors do a good job of making certain technical concepts—such as TCP/IP, IP addresses, and the Domain Name System—understandable, and in explaining Telnet and FTP. Other important searching programs are briefly described.

Coverage of communication features is where the book fails to take the reader from the armchair to the driver's seat. New users would be better served

with some hands-on instructions for sending and receiving e-mail.

The book concludes with a small listing of resources, access providers, and details on getting connected. Geared toward the needs of the PC user, the presentation of connection and pricing options is well done.

In a nutshell, *The Whole Internet* succeeds in teaching basic proficiency, and *The Internet Companion* will help you quickly peruse the Internet from your armchair. □

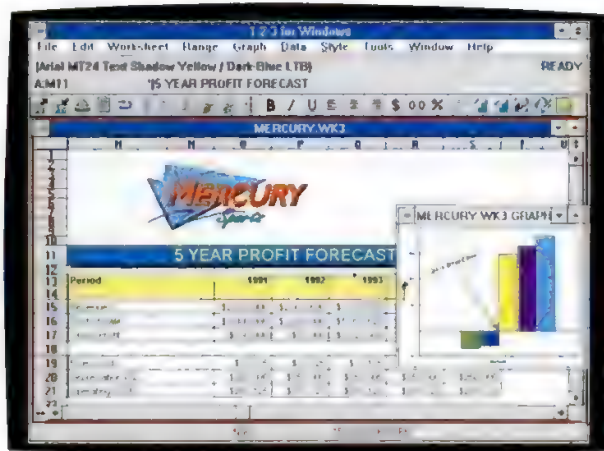
• **The Whole Internet User's Guide & Catalog**, by Ed Krol, \$24.95. O'Reilly & Associates Inc., 103 Morris St., Sebastopol, CA 95472; 800-998-9938. ISBN: 1-56592-025-2.

Circle 302 on reader service card

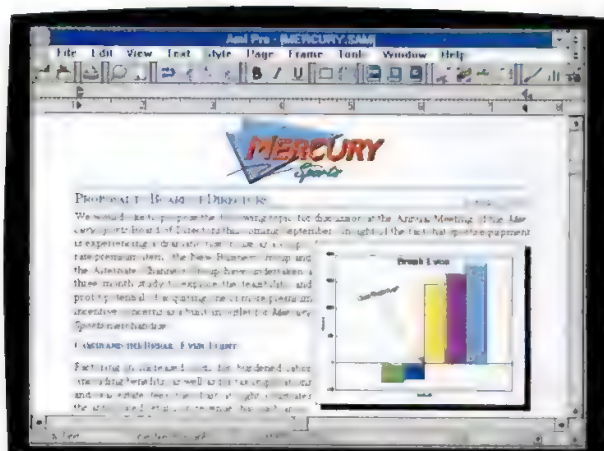
• **The Internet Companion: A Beginner's Guide to Global Networking**, by Tracy LaQuey and Jeanne C. Ryer, \$10.95. Addison-Wesley, One Jacob Way, Reading, MA 01867; 800-447-2226. ISBN: 0-201-62224-6.

Circle 303 on reader service card

Compared to Lotus Microsoft Office look



1-2-3 for Windows Release 1.1 now includes over 25 new features and usability enhancements.



Ami Pro 3.0 includes new features that make it more powerful and easier to use than Microsoft Word for Windows.

It's true. When you evaluate our complete solution for Windows™ desktops and then look at theirs, you'll see why ours is a better business choice.

Of course, both SmartSuite™ and Microsoft® Office include full-featured products. But SmartSuite has been recently updated to include 1-2-3® for Windows Release 1.1 with SmartPak™ and the newly released Ami Pro® 3.0, as well as Freelance Graphics® and cc:Mail™.

All four of these award-winning products share a common interface as well as our innovative SmartIcons™.

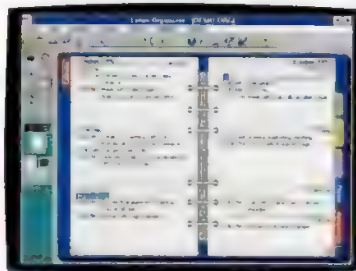
So when you've learned one, you've learned them all.

What's more, SmartSuite delivers some truly unique integration capabilities that aren't possible with Office. All four SmartSuite products,

for example, share data, text and graphs between each application smoothly and seamlessly. So when an outline produced in Ami Pro is imported to Freelance Graphics, it's automatically converted into a Freelance Graphics outline and full-slide presentation. And a 1-2-3 graph exported to Freelance Graphics will arrive, fully editable.

Not so with Excel and PowerPoint®.

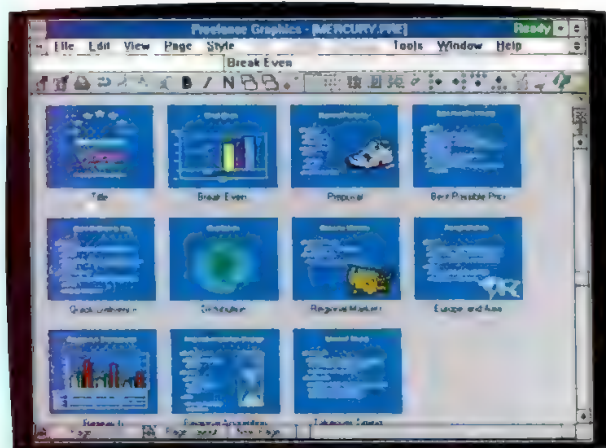
You can even move quickly between SmartSuite



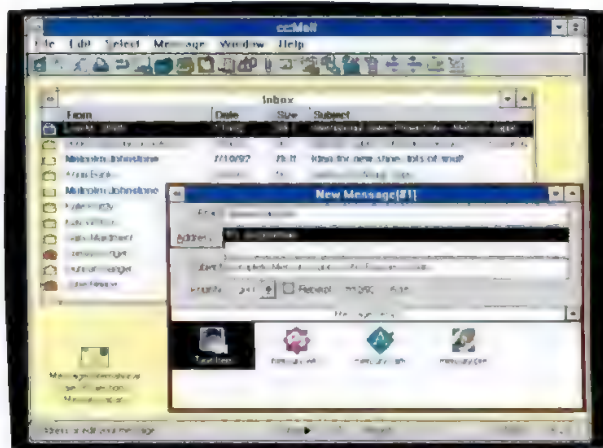
For a limited time, SmartSuite includes Lotus Organizer, the computerized way to keep tabs on all your daily tasks.

*Offer expires 12/31/92 or while supplies last. **Suggested retail value. ***For a full call 1-800-GO-LOTUS. When you purchase 10 SmartSuite packages you'll get a free cc:Mail for Windows Platform Pack (a \$495 value) and SmartMasters are trademarks of Lotus Development Corporation. cc:Mail is a trademark of cc:Mail, Incorporated, a wholly owned

Lotus SmartSuite, is more like a cubicle.



*Award-winning Freelance Graphics
is the easiest, fastest way to create
a stunning presentation.*



*cc:Mail, the world's leading LAN-based e-mail
system, allows you to send documents across all
major networks and computing platforms.*

applications just by clicking the icon of the application you want to open.

Better still, all SmartSuite applications are mail-enabled. So you can use cc:Mail to send "live" documents from within each application. Office, on the other hand, requires you to install and use an optional macro with Microsoft Mail 3.0.

Why is now the best time to buy Lotus SmartSuite instead of Microsoft Office?

For one thing, you just can't beat the total

value. In fact, for a limited time,* **when you buy SmartSuite, we'll give you Lotus Organizer™ (a \$149 value**) absolutely free.** It includes an on-screen calendar, to-do list, planner, address book, notepad and anniversary reminder that are all fully integrated. Plus if you're upgrading from any version of 1-2-3, Symphony®, any Lotus word processor or graphics product, or cc:Mail, you'll save even more. So do the smart thing. Visit your Lotus Authorized Reseller or call **1-800-872-3387, ext. 7309***** for a free demo disk.

Lotus

SmartSuite for Windows

1-2-3, Ami Pro, Freelance Graphics, and cc:Mail

©1992 Lotus Development Corporation. All rights reserved. Lotus, 1-2-3, Ami Pro, Freelance Graphics, Lotus Notes and Symphony are registered trademarks and SmartSuite, SmartSuite for Windows, Lotus Organizer, SmartFax, and cc:Mail are trademarks of Lotus Development Corporation. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.

Get a better deal on a better 1-2-3

Now that's good news for anyone buying a Windows™ spreadsheet. First, we recently updated 1-2-3® for Windows

\$495

so it now gives you more of the features you've been looking for in a Windows spreadsheet. Second, we

lowered the price to just \$495* (Plus, for upgraders, and for a limited time only, we've included the SmartPics™ Clip-art Sampler absolutely free.)

Of course, when you come right down to it, there are plenty of other reasons why 1-2-3 for Windows is the best spreadsheet choice you can make.

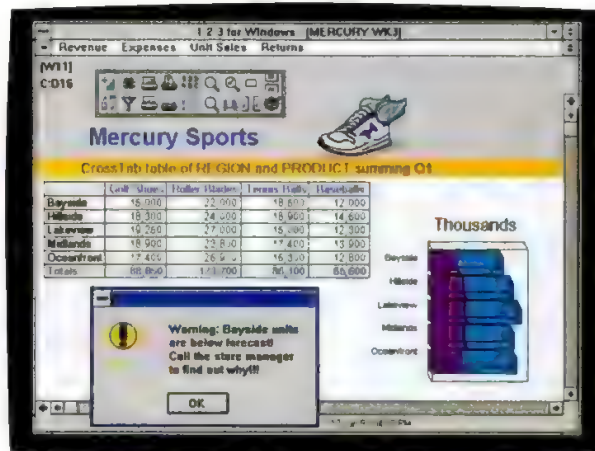
Its features and performance are better than ever.

1-2-3 for Windows now includes more than 25 new features and usability enhancements, as well as a robust set of GUI development tools.

Recent performance enhancements also make 1-2-3 for Windows the fastest-printing Windows spreadsheet for Postscript® output. It also makes the most efficient use of system resources when handling 3D files.

Better still, we're offering license packs for network users so you can set up your network configurations more cost-effectively. All of which makes Lotus® 1-2-3 for Windows the best deal in a Windows spreadsheet.

It's a better transition from DOS to Windows.



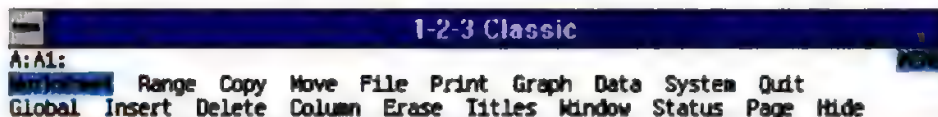
Only 1-2-3 for Windows, with its built-in Classic® Menu, lets you use familiar 1-2-3 commands whenever you choose. Excel, on the other hand, only supports 80%

of 1-2-3 Release 2.01 commands. And has no support for releases beyond.

al 3.

What's more, only
1-2-3 for Windows offers

front-end tool of choice." Excel's data
access capabilities rely on a third-



you a better compati-
bility bridge from DOS
to Windows. And unlike
Excel, 1-2-3 can read and
execute *any* 1-2-3 for DOS file, style
and macro.

All of which means you'll retain your
full investment in 1-2-3 for DOS files
when you move to 1-2-3 for Windows.

**Its 3D technology and external
data access capabilities are
better than Excel's.**

In 3D technology, 1-2-3 is unsur-
passed. It gives you easy access to
256 worksheets and lets you build
true 3D formulas. Excel's Workbook
is a mere imitation. That makes 1-2-3
for Windows a more powerful tool
that truly helps you consolidate data,
spot trends and make better, more
timely business decisions.

Corporate Computing (8/92)
wrote that "for the experienced
1-2-3 database user, 1-2-3 for
Windows with DataLens® is the

party product with limited relational
capabilities.

**There's no better time
to act than now.**

Remember, for a limited time
only, when you upgrade to
1-2-3 for Windows, we'll give
you a SmartPics Clip-art
Sampler absolutely free. It
includes over 100 clip-art images

to help you better
communicate through
your spreadsheet; it'll
do the same with any
Windows application.

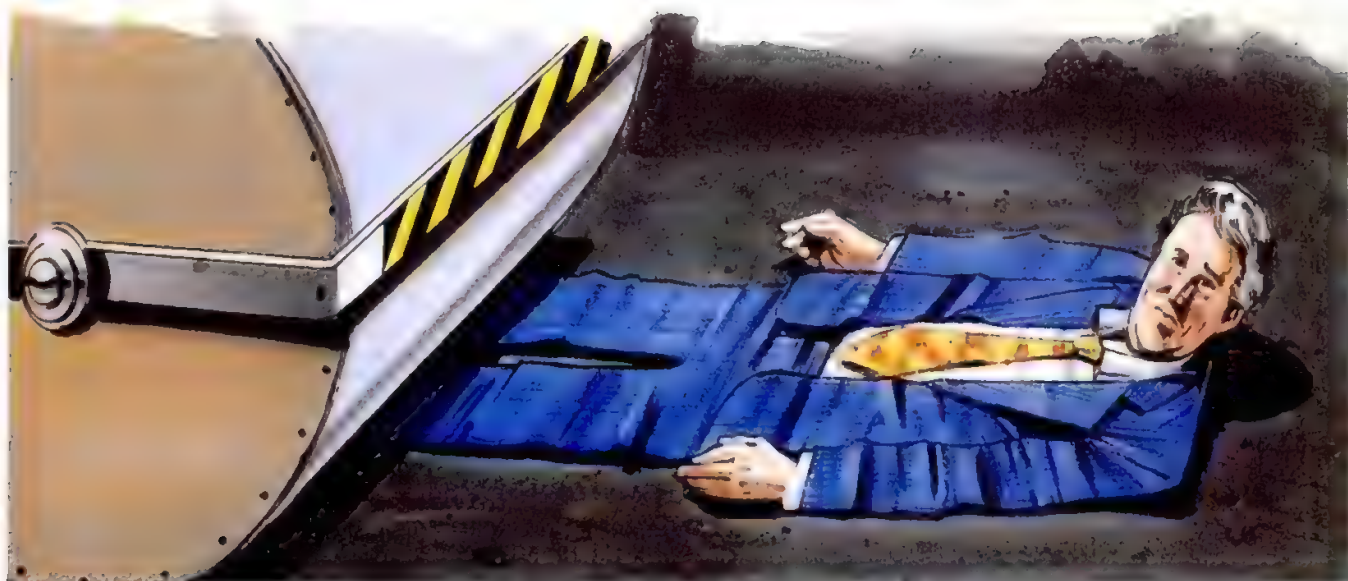


Of course, we still offer our
unique Technology Guarantee
which allows you to upgrade
for just \$49 to any new version of 1-2-3
that is introduced within six months
of your purchase.

So if you're ready to take advantage
of this great upgrade offer, just see your
Lotus Authorized Reseller or call
1-800-TRADEUP, ext. 7261.**



1-2-3 for Windows



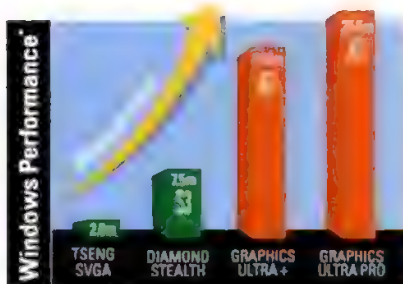
Flatly Refuse to Compromise on Graphics!

Today's graphics cards bulldoze you into a compromise, sacrificing speed for resolution, or resolution for realistic color. ATI's new GRAPHICS ULTRA cards give you all-round performance... speed, color and resolution all at the same time.

Resolution and Color Support	ATI	S3	SVGA
1024 x 768 / 85,000	■	■	■
1024 x 768 / 256	■	■	■

Up to three times faster than competing S3 solutions and even local-bus products, our mach 32 graphics processor propel Windows to an amazing 25 million WINMARKS.*

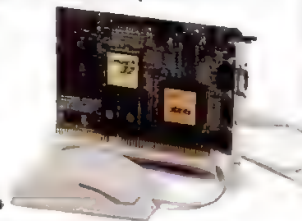
mach 32



Loaded with 2.0MB of video memory, ATI lets you run 1024x768 with 65,000 colors at accelerated speed or work in 24-bit color. All at flicker-free refresh rates up to 76Hz. Our single Windows driver supports painless mode switching, displays a virtual desktop, and provides hardware-accelerated True Type font scaling and smoothing via exclusive ATI CRYSTAL Font technology.

GRAPHICS ULTRA +

- ▶ Fast 21.0 million WINMARK* performance
- ▶ Accelerated 1024x768 at 65,000 colors
- ▶ True color (16.7 million) at 800x600
- ▶ Accelerate multimedia applications**
- ▶ Available in 2.0 MB or 1.0 MB versions
- ▶ Priced from \$399.00***



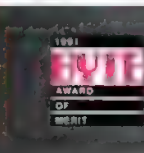
GRAPHICS ULTRA PRO adds:

- ▶ Fast 25.5 million WINMARK* performance
- ▶ Accelerated 1280x1024 at 256 colors non-interlaced at 74 Hz refresh rate
- ▶ Available in ISA, EISA or Micro Channel versions
- ▶ Priced from \$599.00***



Avoid *crushing* disappointment. Get ATI GRAPHICS ULTRA cards for No Compromise Graphics.

ACCELERATORS • GRAPHICS • MULTIMEDIA • COMMUNICATIONS



ATI TECHNOLOGIES INC.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Tel: (416) 756-0718
Fax: (416) 756-0720

Copyright © ATI Technologies Inc., 1992. All company and/or product names are trademarks and/or registered trademarks of their respective manufacturers. *Winbench 2.5 on 486-33 at 1024x768/256 colors at 60 Hz. **Multimedia drivers available 11/92. ***Suggested Retail Prices in US\$. Dealers may sell for less. Prices subject to change without notice. Awards based on award-winning technology of GRAPHICS ULTRA and VGA WONDER.

CIRCLE 228 ON READER SERVICE CARD

Toolkits

REVIEWS OF THE LATEST TOOLS FOR THE PC PROGRAMMER

Edited by Trudy Neubaus

SourceSafe: Multiplatform Version Control to Round Out Your Toolset

BY BEN MYERS

Source code revision control systems have almost always followed the model of the granddaddy of them all, the Source Code Control System (SCCS) that originated with AT&T Unix. Using an SCCS-like system requires that you understand a lot of command line parameters and keywords—a rather unforgiving interface at best. One Tree Software's SourceSafe improves upon the SCCS model and, in the process, greatly enhances ease of use.

The conceptual model for SourceSafe is the *project*, a set of all files used to build a program. Not limited to ASCII program files, a SourceSafe project may also include other files such as Windows resources or program documentation in word processing format.

As with SCCS, you have several choices. You can check out a file from a project intending to update it, get a read-only copy, check an updated file back in, or cancel your intention

to update. While you have a file checked out for update, nobody else can do the same. Getting a file from SourceSafe copies it to the directory where you do your software development, and checking it back in copies or moves it in the reverse direction. SourceSafe keeps track of all the revisions you make to any file and can reproduce any revision you want.

SourceSafe is usually installed on a network of PCs, with the SourceSafe software and programs under its control available from a file server to developers who have been granted access rights. If your development network uses Novell NetWare, SourceSafe integrates itself automatically with the NetWare login scheme to simplify administration. The SourceSafe administrator uses a dedicated administration program to set up access rights. For networks other than NetWare, you must set up DOS environment variables to tell SourceSafe who you are and what your SourceSafe password is. SourceSafe works with any network that implements DOS-level file and record locking.

SourceSafe offers three interfaces to manage the files under its control. You can access SourceSafe via a Windows program, a DOS-based menu program,

and a DOS command that accepts either individual SourceSafe commands or a file containing a set of commands. The Windows SourceSafe program rounds out the set of tools needed to do software project development entirely with native Windows-based tools. And since the DOS and Windows SourceSafe programs operate very much like one another, it's not confusing to switch back and forth.

Files that are common to two or more projects may be shared among the projects, an approach that lets you minimize the number of copies of a software module that might proliferate within a software development group.

Installing SourceSafe is clean and easy. It comes with a single 148-page manual and a reference card printed on heavy card stock, and it is available on either 5.25-inch or 3.5-inch disks. The only minor hitch in the documentation is that it does not direct you to run the administration program before doing anything else. Without having run the administration program to set up its authorized users, SourceSafe tells you that you are not permitted to use it, which is a bit baffling.

In its current release, SourceSafe is both highly workable and useful, but it could benefit from a series of small improvements, such as adding a Windows icon that may be clicked to get SourceSafe into action quickly in the Windows environment. Right now you must either add a program to an existing program group within the Windows program manager, or click on the SourceSafe

program name within the Windows file manager.

It would also be nice if SourceSafe had an SCCS-like keywording mechanism to generate source code comments

containing the source module's filename, its revision number, and the time of file access. Then you could determine by inspection exactly which version of source code you had checked out.

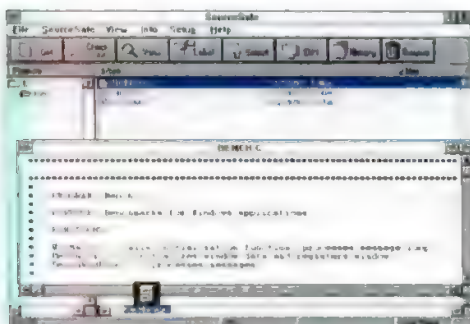
Neither the menu-based DOS nor the Windows SourceSafe programs have functions for producing reports that might be required to satisfy auditing and legal rules. You need to rely on the command line program to produce such reports about the history of a file or a project, and to tell you about all projects that share a file.

At first you may balk at SourceSafe's seemingly high price tag, almost as much per user as a typical compiler. But source code control is like a file-backup utility, an antivirus program, or any other safety measure: You have to use it for it to work, and if you must rely on its coming through for you even once, it probably is worth the price you paid. □

• SourceSafe, Version 2.0.

List Price: *Combination (DOS and Windows software): \$445 single user, \$1,795 for five users, \$3,095 for ten users; DOS or Windows software only: \$295 single user, \$1,195 for five users, \$1,995 for ten users.* Requires: *DOS 3.3 or later, Windows 3.1, 2MB of hard disk space.* One Tree Software, P.O. Box 11639, Raleigh, NC 27604; 800-397-2323, 919-821-2300.

Circle 451 on reader service card



You can use the Windows Notepad from within SourceSafe to view a program source file.

When the mission is critical, you need a PS/2®. When data flows fast and furious, you need a PS/2. When success or failure hangs in the balance, you need a PS/2.



All our new PS/2s were designed to thrive under the most grueling conditions—your typical business day.

PS/2

From standalone muscle machines to LAN servers that can dish out whatever you can serve up, the PS/2 has always been—and always will be—the personal computer you can count on to get the job done. The important jobs. The tough jobs. The jobs you wouldn't trust to some minor league box. That's because every PS/2 is built and tested to withstand your worst nightmare. So when a PS/2 starts working, it stays working. Around the clock. Around the year. Around the world.

And we plan to keep it that way. With powerful, high-end workstations like the new PS/2 Model 77 486 DX2 and Model 57

*Sale or delivery of the IBM PS/2 Server 85 is subject to FCC approval. **The three-year on-site warranty and four-hour average response time apply only to all newly announced IBM PS/2 machine types. Four-hour average response when serviced by IBM or IBM Authorized Personal Systems Servicers. Available Monday–Friday, 8 a.m. to 5 p.m. in your time zone. †In Canada, call 1 800 465-7999. IBM, PS/2 and OS/2 are registered trademarks and HelpWare and HelpCenter are trademarks of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation. © 1992 IBM Corp.



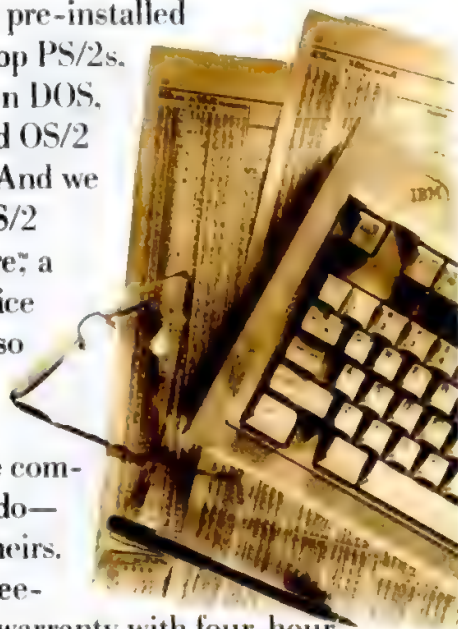
Some jobs are more So are some



486SLC2. With the most diverse line of servers in the industry, from the new PS/2 Server 85 through Server 295.* With the most advanced arsenal of technology available. And with full expandability and maximum flexibility, your IBM PS/2 was built to do more than just run. It was built for the long run.

OS/2® is pre-installed on new desktop PS/2s, so you can run DOS, Windows™ and OS/2 applications. And we back every PS/2 with HelpWare™, a range of service and support so complete, there's only one thing the competition can do—wish it was theirs. You get a three-year on-site warranty with four-hour average response time, 24-hour-a-day/seven-day-a-week assistance and more.**

So, while all kinds of computers make claims about power, a PS/2 offers the most important kind of all. Staying power. For more information or an IBM authorized dealer near you, call our Personal Systems HelpCenter™ at 1 800 772-2227.†



serious than others. computers.



Michael J. Miller

The Best Software Is a Drag

If there's one child of the graphics generation that's been neglected, it's drag-and-drop computing. While pull-down menus, icons, and what-you-see-is-what-you-get text have monopolized our attention, we've underestimated what may be

the most important innovation in graphically based programs. The power of drag-and-drop functions is making formerly complex software—as diverse as database management and graphics packages—immeasurably easier for nonexperts to master.

The ability to drag and drop an object where you want has existed quietly in many graphical user interface applications. Implementations range from the Windows 3.1 File Manager to the viewer and printer icons in the Norton Desktop for Windows to the more object-oriented design of OS/2 2.0's Workplace Shell. But what impresses me lately is the integration of drag-and-drop features into the applications themselves.

Take a look at the file-management and programming arenas—Microsoft Visual Basic, for instance—and you'll see that drag-and-drop has been an essential component of applications for some time. The power of drag-and-drop becomes even more useful in the hands of people without programming skills. Just imagine directing your applications to perform tasks that would normally require programming.

In many respects, today's drag-and-drop implementations are expansions of the toolboxes we're familiar with in graphical applications. Painting, drawing, and desktop-publishing programs ranging from PC Paintbrush to PageMaker make great use of toolboxes that let you select a circle or square and instantly create it in your document.

VISIO'S NEW VISION

Take this idea into the world of illustration software and you get ShapeWare Corp.'s Visio, a wonderful new graphics program. While other drawing tools expect you to construct drawings based on a set of tools, Visio takes a different tack: It expects you to cre-

ate a drawing based on a series of master shapes contained within a "stencil" window. To create an office floor plan, you would choose the space-plan template; drag the master shapes for chairs, doors, desks, and other office accessories from the stencil window onto your drawing; and drop them into position.

Visio gives users even more power by supplying a variety of "connectors" that define how lines between objects behave. For instance, as you shuffle individuals or groups of people to different places on an organization chart, the intelligent connecting lines stay glued.

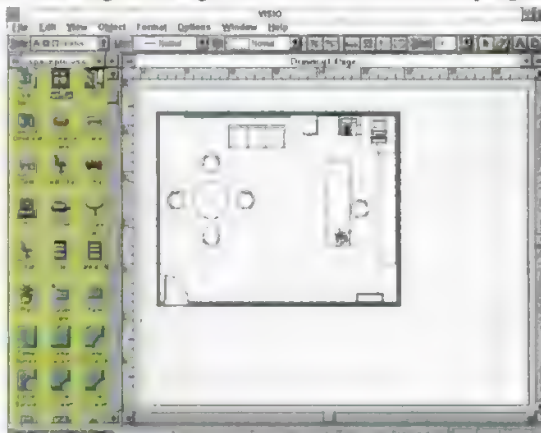
Similar ideas have already been implemented in specialized drawing programs designed for organization charts or floor plans. But what makes Visio unique is that these tools can be used for anything. The program comes with a large group of basic templates, each containing its own stencils, styles, and settings. This makes for a wide variety of applications, including organization charts, flow charts, presentations, and floor plans.

You can mix and match shapes from multiple stencils and easily create your own stencils and master shapes, starting from scratch or modifying the ones that come with the program.

The result is a program that gives people who can't draw the tools to do so. It's also flexible enough to let those who can draw create new objects that other users can incorporate into their drawings.

Visio demonstrates the potential of a new class of programs that extend simple drawing tools to full-blown drag-and-drop tools for a variety of useful shapes.

Now take the same idea and apply it to database application development software. The result is a new language of databases that combines drag-and-drop functionality with visual clues for creat-



The hidden power of drag-and-drop tools gives new drawing and database packages a clear advantage.

Michael J. Miller

ing forms. It's certainly a big step forward from the days of tedious manual programming.

There are essentially two kinds of databases: complicated packages that require programming but are extremely powerful, and less-sophisticated nonprogrammable databases that are easy to use but functionally limited and unable to create sophisticated applications.

The benefits of incorporating drag-and-drop with database development are undeniable: It's now easier for nonprogrammers to create sophisticated applications. Just look at the graphical databases that are covered in this issue's roundup of nonprogrammable databases.

In many of these programs, we see the use of drag-and-drop for placing a field onto the design of a database form or report. Combine this with other visual clues and application design becomes much simpler.

Database packages are using visual tools in different ways. Claris Corp.'s FileMaker Pro 2.0 for Windows lets you design a form

by dragging and dropping field objects. Once the object is in place, the program displays a dialog box in which you choose (or create) the field you want to place and decide whether or not you want to display a field label. A similar tool lets you do the same for reports.

FileMaker Pro also offers easy ways for nonprogrammers to click on option buttons and accomplish the same database-design tricks that used to be difficult to program—from creating pop-up lists of choices to setting up your form so it looks up data from another table. And this is in addition to the visual clues that Claris borrowed from the Macintosh version, including the cardfile metaphor and the WYSIWYG list of font names. (I guess it took a software company that focused on the Macintosh to implement this in Windows.)

Other databases are taking different paths. In Approach Software Corp.'s Approach, you can easily drag and drop fields, check boxes, or buttons onto a form or report. When you choose the field tool and drop it onto your form, the program opens a dialog box where you select the field to be placed, choose a border, and are given the option of including a label or list box. At the same time, the program displays a

sample, so you can see what your selections actually look like. This makes it easy to set most of your options in one step. Approach offers a similar visual method to help you link multiple tables in a database.

HIGH-END DATABASES, TOO

Drag-and-drop has been implemented in all sorts of databases, ranging from these relatively simple programs all the way up to some of the new graphical database programming systems, such as Microsoft Access, Superbase 4, Version 2.0, and Borland's upcoming Paradox for Windows. These higher-end systems are able to harness the drag-and-drop idea, so even sophisticated procedures are easier to execute.

For instance, Microsoft Access has tools that let you easily place a check box, list box, or subform within a form you're designing. Paradox for Windows uses drag-and-drop to set up relations between fields and has a wonderful query-by-example tool.

The trend to recognize here is the new visual approach to creating drawings and database applications. Drag-and-drop features and visual clues take tasks that once required lots of time and expertise and make them available to everyone. Everyday computing just got a whole lot simpler. □

INTRODUCING The First Diagnostic that's All PRO and No CON.



CHECK IT PRO
ADVANCED DIAGNOSTIC SOFTWARE

Check/It PRO: SysInfo provides the most accurate and comprehensive configuration data ever available. Whether you're planning an upgrade, trying to find a set-up problem, or simply becoming familiar with a new system, Check/It PRO: SysInfo has the information you need.

- Processor/Co-Processor Model, Manufacturer, and Speed (MHz)
- Detailed Memory Maps: Base/UMB, EMS, XMS, TSRs, Device Drivers and Interrupt Vectors
- REAL Hard Drive Geometry, Model, and Interface Type: MFM, RLL, IDE, SCSI, & ESDI
- Detects Network, Modem, FAX, CD-ROM, and Sound Card Details
- Edit/Save/Restore CMOS, plus DOS & Windows System Files
- Performance Benchmarks compared to Standard or Custom System Profiles
- Built-In Technical Reference Library

The PROs and CONS of SysInfo Utilities

There's a real difference in the information displayed by Check/It PRO, and other utility programs. For example, Check/It PRO determines the "live" status of each IRQ—but other programs just show you "standard" assignments. Check/It PRO also tests your hard drive to find out what type of drive is really attached, not just how CMOS is set up. If it was easy, every program would provide this type of information; but the only one that does is Check/It PRO. No matter what other program you have, you need Check/It PRO too.

Try it for yourself. We think you'll agree that the new Check/It definitely qualifies as a real PRO.



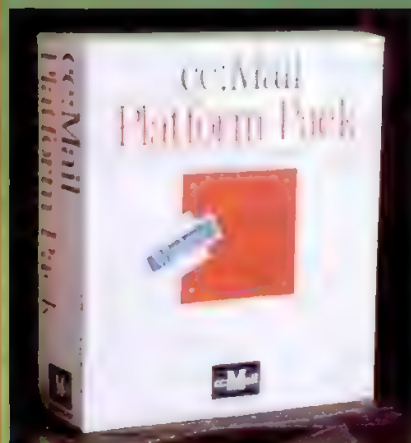
TouchStone
Software Corporation
2130 Main Street, Suite 250
Huntington Beach, CA 92648
Fax (714) 980-1888

(800) 531-0450 or (714) 969-7746

Copyright © 1992 TouchStone Software. ALL RIGHTS RESERVED. Check/It PRO is a trademark of TouchStone Software Corp. Huntington Beach, CA.

CIRCLE 021 ON READER SERVICE CARD

The Ultimate in Electronic Mail



cc:Mail for Windows

The Leading, Enterprise-Wide, LAN-Based Electronic Mail System

It delivers! cc:Mail is the world's leading electronic mail package because it delivers more than messages. It handles just about any electronic mail need you might have, no matter how large or small your workgroup is. With it you can send text, files, graphics and faxes across all major area networks such as Novell, LAN Manager and Banyan. Without needing new hardware.

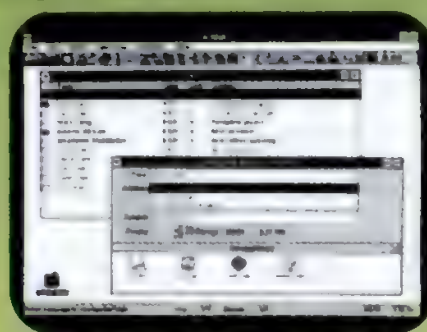
cc:Mail Windows Platform Pack, v1.11 **CALL**
(create and manage one post office, which normally corresponds to one server)

cc:Mail 10 User Pack, v4.0 **CALL**
(add up to 10 people to your cc:Mail post office)

cc:Mail 25 User Pack, v4.0 **CALL**
(add up to 25 people to your cc:Mail post office)

cc:Mail Remote, v3.31 **CALL**
(remote access for one standalone or MS-DOS portable PC)
Transmit over ordinary phone lines, data PBXs or X.25 network)

Many other accessories for network scheduling, gateway to other mail systems, faxing capability, and links to main-frame mail systems are available. Call for more information.



Over two million satisfied customers have already given cc:Mail a first-class rating. For example, Windows users love its easy-to-use interface, SmartIcons, and dialog boxes.

A **CallSoft** Special Offer !



JetForm E-Mail is the only standalone, full-featured forms product for cc:Mail in the forms world. **JetForm E-Mail** enables users to send and retrieve complex forms designed with **JetForm Design for Windows** and the data they contain throughout the cc:Mail network. User can include data entry fields, calculations, routing info, security local printing and more! **JetForm Design and E-Mail** is the perfect program to create sales/call reports, personnel/expense reports, P.O./requisitions, time sheets and many more. The possibilities are endless. Now you can use your E-Mail for more than just sending messages!

JetForm Design and 5-user Pack only \$99!
(a \$990 Value) Limited quantity. Order your cc:Mail and JetForm bundle pack from **CALLSoft** Today!

CallSoft 800-777-5014

2 Riverview Drive, Somerset, NJ 08873



LOTUS

cc:Mail

THE AD TYPEFACE ARE AFRAID

infiniType™ Plus
124 TYPEFACES
\$99.95
suggested
retail price

This ad contains some very disturbing news for the big typeface companies. *infiniType™ Plus* is here...with professional quality

typefaces at a fraction of the price major type suppliers are charging.

infiniType Plus includes 124 different typefaces developed by top German foundries. Imitations? Knock-offs? Absolutely not! The quality of *infiniType Plus* rivals, and often surpasses, that of big-name type vendors... at an astonishingly low price.

Huge Collection- 124 Typefaces

infiniType Plus puts an extensive collection of the world's most popular and useful

typeface designs—in the hands of anyone using PC-based applications.* All typefaces are provided in the industry-standard PostScript Type 1 *and* TrueType formats, and can be used with Microsoft Windows, OS/2 or any other applications that support the PostScript or TrueType formats.

Quadrat Melbourne
PEYNOT *Commercial Script*
Bodoni Roman Onstage
Ondine Pedro MicroSquare
Florence Script **FetteGrafur**
Palazzo Hobo COMIX
Goudy OldStyle Clearface
Expresso Baskerville Sans

This is a small sample of the 124 professional quality *infiniType Plus* typefaces.



THE BIG COMPANIES D TO READ.

High-Speed Scaling Engine

In addition to 124 great typefaces, *infiniType* Plus also includes a type scaling engine that supports popular DOS applications like WordPerfect, LetterPerfect, WordPerfectWorks, Microsoft Word and Works. It also includes 80 special effects (like drop shadows, gradient fills, patterns, screens and dozens more). Scale type up or down...create special effects...add impact...instantly.

Lean efficient *infiniType* Plus was designed for quality and for speed. It provides superior results with any laser, ink jet or dot matrix printer. The *infiniType* engine also lets you

use any PostScript Type 1 typeface with your DOS application.

infiniType Typeface Packages only \$49.95

Suggested Retail Price

This is the best value in professional-quality typefaces ever offered.

Fifty faces for under

\$50—provided

in both PostScript

Type 1 and TrueType formats. Compatible with *infiniType* Plus, Microsoft Windows, OS/2 and other applications that support PostScript or TrueType.

If you've been scared off by the high prices of the big-name typeface companies, take heart. The tables have been turned. Now, the big guys have a reason to worry. *infiniType*...superior type at an affordable price. It's about time.

Ask your local software retailer, or call us at 1-800-346-5764 for a dealer in your area. Ask for a free demo diskette.



A COMPARISON THAT SCARES THEM TO DEATH

infiniType Plus v. the Big Typeface Companies

	Us	Them
Font Quality	Superior	Superior
Cost	\$99.95	Expensive
Format	PostScript and TrueType	One or the other, not both
Scaling Engine	Yes	No (if yes, fewer faces)

infiniType Plus v. the Little Typeface Companies

	Us	Them
Font Quality	Superior	Inferior
Cost	\$99.95	Comparable
Format	PostScript and TrueType	One or the other, not both
Scaling Engine	Yes	No (if yes, fewer faces)

infinType^{Plus}

SoftMaker

2195 Faraday Ave. Suite A
Carlsbad, CA 92008

*Typefaces are also available for the Macintosh. *infiniType* is a trademark of SoftMaker, Inc. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. OS/2 is a trademark of IBM. WordPerfect, WordPerfect Works and LetterPerfect are registered trademarks of WordPerfect Corporation. TrueType is a registered trademark of Apple Computer, Inc. PostScript is a registered trademark of Adobe Systems, Inc.

Four reasons to buy a TI microLaser™ printer.



Now there's a way for you to put the power of Microsoft® Windows™ on paper — microLaser from Texas Instruments.

Designed to be Windows-compatible, there's a microLaser just right for your needs, whether you need a personal or shared printer. Here's why:

1. Compatibility With HP LaserJet® emulation and Adobe® PostScript® software, microLaser easily supports your demanding applications. And with our Microsoft Windows driver, set it and forget it with all Windows applications.

Not only does PostScript give you scalable outline fonts and graphics, it also means that your microLaser works in computing

environments like Windows, DOS®, Apple® Macintosh®, OS/2® and UNIX®.

2. Performance When it comes to printing high-quality documents fast, microLaser really makes you look good. At either nine or 16 pages-per-minute, microLaser printers speed you through documents in a hurry. Plus PostScript means what you see on your screen is what you get on paper. You can even turbocharge your microLaser with a RISC processor for blazing fast graphics.

3. Reliability When you buy a printer, you want it to print. And print. And print. That's just what the microLaser does.

Take our personal microLaser Plus for

example. With its high duty cycle of 10,000 pages-per-month* and a standard one-year limited warranty**, you can rely on your microLaser to work the first time, every time, for years.

4. Value Starting as low as \$999†, there's a microLaser designed to fit any budget. From the single user all the way up to a network. Consider this, too: microLaser's average cost per page is only 1.9 cents‡, while some laser printers average around 3.3 cents. The microLaser not only makes sense, it saves you money, too.

For details on the right microLaser for you and the name of the nearest dealer, call

1-800-527-3500.

The microLaser PS17 has earned the 1990 PC World Best Buy award; microLaser PS35 has earned the 1990 InfoWorld Excellent Value award and 4½ time from MacUser, October 1990.

Features	microLaser Plus Basic	microLaser Plus PS17/PS35	microLaser Turbo	microLaser XL Turbo
PPM	9 ppm	9 ppm	9 ppm	16 ppm
Emulation	HP LaserJet II	HPLJL/PostScript	HPLJL/PostScript II	HPLJL/PostScript II
Processor	68000	68000	RISC/8220	RISC/8220
Fonts	14 HP Fonts	17 or 35 Scalable	35 Scalable	35 Scalable
List Price	\$999	\$1,399/\$1,499	\$1,749	\$3,649

*Based on estimated typical usage. **For more information on service upgrade options, call 1-800-847-5757 in the U.S. and 1-800-268-6314 in Canada. †Suggested retail price — dealer prices may vary. ‡Based on suggested retail price of consumables and approximate page coverage using for each consumable at 4% black (toner, developer and OPC). microLaser is a trademark of Texas Instruments Incorporated. Microsoft and DOS are registered trademarks, and Windows is a trademark of Microsoft Corporation. Adobe, PostScript and the PostScript logo are registered trademarks of Adobe Systems Incorporated which may be registered in certain jurisdictions. LaserJet is a registered trademark of Hewlett-Packard, Inc. Apple and Macintosh are registered trademarks of Apple Computer, Inc. OS/2 is a registered trademark of International Business Machines Corporation. UNIX is a registered trademark of AT&T. ©1992 TI 76543

CIRCLE 353 ON READER SERVICE CARD

**TEXAS
INSTRUMENTS**



Bill Machrone

Secrets in Your Socket

Mr. Machrone? I was reading your columns on surge suppression and power management recently, and I represent a company that has some new and exciting ideas about power quality, and I was wondering if you would like to take a look at the product.

I love conversations that begin that way.

The company turned out to be Perma Power Electronics, hardly a newcomer on the surge-suppression scene. The product was the Socket Sentry Site-Wiring Quality Monitor and Surge Suppressor. What they were telling me seemed impossible. It looks like an ordinary power strip, but it has an active monitor that continuously checks the quality of your building's electrical ground.

I've written before about the importance of good grounding in the proper operation of computer equipment, especially networks. Bad grounding introduces a safety hazard. The "hot" side of the circuit has one connection at the panel. The "neutral" side has another connection. The ground is connected to the same place as the neutral line. For safety and freedom from noise, the neutral and ground lines should have no resistance. If there's any resistance between the two, a voltage differential can build up across the resistance and become a source of noise, and can even build up to hazardous levels, where you can get a shock by touching two pieces of grounded equipment that happen to be plugged into different outlets. Ground currents that can't find their way back to the electrical panel because of high resistance may find an easier path through the shield braid or ground wire on your network connections, through your modem, or through you. These errant AC voltages introduce errors onto the network, and, at worst, can destroy network equipment.

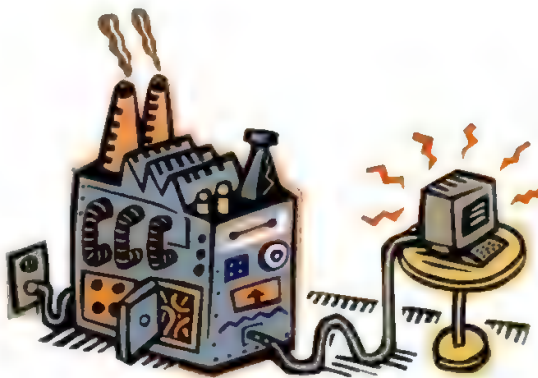
You might think that you could check ground resistance simply by sticking an ohmmeter into the neutral and ground sockets. Don't do it! You know that the round one is ground, but do you know which of the flat sockets is hot and which one is neu-

tral? Furthermore, do you have any assurance that the socket wasn't wired backwards? I find sockets with reverse polarity entirely too often for my comfort. At best, your ohmmeter would blow a fuse; at worst, it would be charred plastic. (I have to admit that I have just such a charbroiled ohmmeter as not-so-living proof.)

There are safe ways to thoroughly check a socket for correct wiring, grounding, and other electrical errors. Ecos Electronics Corp. makes a range of power analysis devices, from the \$200 Accu-Test II to the PAK-1B Comprehensive Power Analysis Kit, which, at \$1,700, will tell you more about your electrical service than you ever wanted to know. SureTest has its models ST-1 (\$100) and ST-1P (\$180). The ST-1P (a favorite of fellow columnist John C. Dvorak) tests the resistance of the ground circuit in addition to checking for the usual wiring errors. The drawback to all these devices is that they're designed to verify the proper wiring of new construction or to conduct occasional site audits.

Postinstallation checks and audits would be fine if industrial electrical distribution systems were unchanging. Unfortunately, they're updated, revised, repaired, and expanded all the time. Mistakes creep in. Giant air-conditioning compressors wind up drawing from the same line you thought was dedicated to your server closet. Worst of all, the ground connection you depend on heavily for safety and electrically quiet operation is fragile and easily compromised.

In truth, the grounding system in your home is probably better than the one at work. Modern home systems use three-conductor wiring to carry the hot, neutral, and safety ground lines. Modern commercial installations use three-wire, but the vast majority depend on thin-wall conduit to pro-



*Which is smarter, your computer
or the power strip it's
plugged into?*

Hassle-Free Printer Sharing

Give everyone in your office their own HP LaserJet printer, without having another one.

Any Office Any Budget Any Printer

Advanced printer-sharing technology. Our **ServerJet** products give up to 12 users a direct line to the printer. **ServerJet** also lets users switch back and forth between two printers — without leaving their chairs. People won't be lined up, disks in hand, waiting to use the PC connected to the printer. Each user can simultaneously send *their* print job, *their* way, thanks to **ServerJet** buffer memory (up to 4MB).

Effortless Installation

Just plug the **ServerJet** into the printer.



Run telephone-type cable to any desk, anywhere. And once your **ServerJet** system is up and running, its lightning speed (up to

115.2Kb) will save you time and money all around.

Easiest Installation, Fastest Performance On A Novell Network

Many users have installed our product in five minutes. We can turn your LaserJet into a stand-alone print server — one that gets jobs to the printer 3 to 5 times *faster* than Novell's Print Server utility. And you can connect the printer anywhere on the network.

Printer Sharing For The New HP LaserJet 4

We keep pace with printer technology. That's why we worked closely with HP to have *seven* advanced printer-sharing devices ready for their powerful new LaserJet 4.

Since 1987, people have relied on ASP for cost-effective, *hassle-free* printer-sharing. And because we stand behind our product, we offer you a 30 day trial with our **ServerJet** — no risk, no obligation.

The call is free. The trial is free.

800-445-6190

DEPT C2155



160 San Gabriel Drive, Sunnyvale, CA 94086, USA
Telephone: 408-746-2965 • Facsimile: 408-746-2803

Bill Machrone

vide the safety ground back to the electrical panel. In home installations, metal electrical boxes are increasingly replaced by plastic, and the safety grounds are attached to the green screw on the outlet, not to the electrical box. Not so in commercial installations, where if there's a green wire at all, it's probably attached to the box, not the outlet. With the three-wire installation, you're depending on the screws that hold the outlet to the box to make the ground. With the conduit, you're depending on slip joints, collars, and screws as well as clean, corrosion-free metal-to-metal contacts for that safety ground. The number of things that can go wrong rises exponentially.

MORE THAN A FEELING

This is not just hypothesis. I loosened the screws holding the outlet to the junction box in the hall just outside my office at ZD Labs, which is less than a year old. I plugged in the Socket Sentry, then wiggled the outlet. In some positions, the ground circuit rose above the 1.5- to 2-ohm threshold the Socket Sentry detects. It sounded off with a shrill alarm, causing fellow employees to come out of their offices and cubicles to find me cross-legged on the floor, poking a screwdriver into the near vicinity of the outlet. The things we do in the name of science.

Perma Power's little wonder has a big advantage over all the professional gear I mentioned earlier: You can leave it plugged in. Using the "rust never sleeps" dictum, your power distribution system is getting slowly, progressively worse, and some day it'll fall below safety standards. You may not do another site check for a year—most likely never. The day it goes too far, a Socket Sentry will let out a yell. It has a few other nice features, too: detecting reverse polarity, neutral-to-ground voltage faults, and failure of its own surge suppressors.

This latter trick is one of the best, since the "suppression OK" lights on the vast majority of surge suppressors are all but worthless. You can remove all of the MOVs from them, and the light will continue to glow merrily. The Socket Sentry actually shuts itself off if the MOV suppressors approach the end of their useful life, and will not turn itself back on. If an MOV fails to open, the test circuitry detects it and shuts down the device. Perma Power is confident enough that it offers a lifetime warranty. The suggested retail price is \$169, but you should be able to find the Socket Sentry for \$99 with savvy shopping. A flat-out bargain. □

ServerJet is a trademark of ASP Computer Products, Inc. / HP LaserJet is a registered trademark of Hewlett-Packard Co. / Novell is a registered trademark of Novell Corp.

Powerful, Colorful, Light & Loaded.

The ZEOS® Color Notebook. Only \$2695!

Remember what a difference it made when you switched to a color desktop? With the ZEOS Color Notebook, you'll enjoy vivid colors from a palette of 256 on your full-size 9.5" display. And there's more.

✓ Fast drives and loads of storage with hard disk right up to 130MB. ✓ Unbelievable 25MHz SL performance, coupled with our 64K built-in cache. Standard. ✓ Up to 20MB of high-speed RAM for the most demanding applications. ✓ A built-in high density 1.44MB 3.5" floppy drive. ✓ Serial, parallel, external VGA and keyboard ports. Use your system as a desktop PC too! ✓ Send and receive fax modem available, so you can always stay in touch. And that's not all.

THE INTELLIGENCE OF THE 386SL CHIP.

Intel designed the new 386SL processor specifically for notebooks. And they were right on target! You'll find that this sharp new processor extends your battery life significantly because it's intelligent enough to power-down the memory, disks, modem, and more when they're not in use. It's perfect for the stop-and-go computing that you're likely to do every day.

MANAGE YOUR POWER.

Or if you're working non-stop, you'll get even more out of the battery by using the programmable power management features. And here's another really neat benefit we know you'll love. You can change batteries without having to shut off the system! You can even use Suspend/Resume when you're working in Windows. Speaking of Windows...

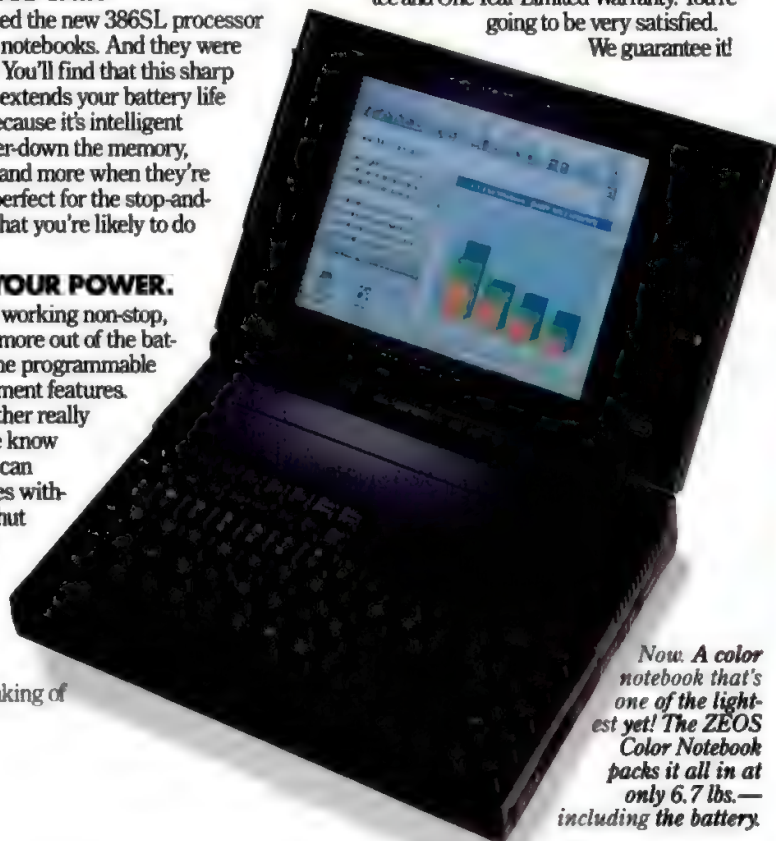
FREE LOTUS SOFTWARE.

We don't just stop with great hardware. In packages 2 and 3 we're giving you—absolutely free—your choice of either Lotus 1-2-3, Ami Pro or Freelance Graphics. And that's in addition to DOS, Windows, and the new Lotus Organizer—the personal information manager highly recommended by *PC Magazine*. With all the free software you get from ZEOS, you save hundreds of dollars!

WE'RE HERE FOR YOU 24 HOURS A DAY.

Buying from ZEOS means you also receive our award-winning after-the-sale support and service: 24-Hour-a-Day Toll-Free Technical Support, 365 days a year. You also receive our 30-Day Absolute Satisfaction Money-Back Guarantee and One Year Limited Warranty. You're going to be very satisfied.

We guarantee it!



Now. A color notebook that's one of the lightest yet! The ZEOS Color Notebook packs it all in at only 6.7 lbs.—including the battery.

FINALLY...AN AFFORDABLE COLOR NOTEBOOK.

Choose your package—or we can custom-build to your specifications!

PACKAGE #1 ONLY \$2695

- 386SL-25 MHz CPU with 64K cache.
- 2MB RAM.
- 60MB high-speed IDE hard drive.
- Built-in high-density (1.44MB) 3.5" floppy drive.
- High-res 640x480 passive matrix color VGA LCD.
- A slim 8 1/2" x 11 1/4" total system weighs only 6.7 lbs. with battery!
- Light, slip-in, slip-out NiCad battery. A whopping 2.5 hours of battery life typical; more with power management.
- Trickle-charge or one hour quick-charge. Extra battery packs available.
- Suspend/resume—even in Windows.
- When battery runs low you can change batteries without having to shut off the system!
- 85-key keyboard with embedded numeric keypad, 12 dedicated function keys, and true 101-key emulation. Inverted T cursor layout.
- Serial, parallel, keyboard and external video ports.
- Math coprocessor support.
- 30-Day Absolute Satisfaction Money-Back Guarantee and complete ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24-Hour-a-Day Toll-Free Technical Support. 365 Days a Year.

PACKAGE #2 ONLY \$3295

- Load up your Notebook! We've included free software, internal send/receive fax modem and more...an incredible value!
- 4MB RAM.
 - 60MB IDE hard drive.
 - Internal send and receive fax modem.
 - Custom-fitted carrying case.
 - Genuine Microsoft Mouse.
 - MS-DOS 5.0, Windows 3.1, the new Lotus Organizer, and your choice of either Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics for Windows.

PACKAGE #3 ONLY \$3895

- Go to 8MB of memory, 130MB hard drive, extra battery...this could be the only PC you'll ever need!
- 8MB RAM.
 - 130MB IDE hard drive.
 - Internal send and receive fax modem.
 - Custom-fitted carrying case.
 - Additional slip-in, slip-out NiCad battery.
 - Genuine Microsoft Mouse.
 - MS-DOS 5.0, Windows 3.1, the new Lotus Organizer, and your choice of either Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics for Windows.

ORDER NOW TOLL FREE 800-554-7172

Fax Orders: 612-633-1325
Government: 800-245-2449
Outside U.S. and Canada: 612-633-6131
Hearing Impaired (TDD): 800-228-5389
MasterCard, VISA, Discover, American Express, Z-Card, COD and Leasing Programs.
Open 24 Hours a Day, 365 Days a Year.



Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs are available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1992, ZEOS International, Ltd. 1301 Industrial Blvd., Minneapolis, MN 55413, USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). CNBR PC/M 9001B

CIRCLE 036 ON READER SERVICE CARD

The only notebook with a tilt & swivel display. Great for sharing data or keeping it private. Easily adjusts for perfect viewing.



This fine Italian leather carrying case is an additional option. Loaded with pockets and features everyone will appreciate.



Digital brightness and contrast buttons make screen adjustment so easy.

ZEOS® Freestyle/SL. More features at a lower cost than any other notebook.

To try and compare the new ZEOS Freestyle/SL to any other notebook is next to impossible. Because nothing else has all its features. And even with all these great features, nobody can match the price. Features and price. It would seem the new ZEOS Freestyle/SL is the best of all worlds. It is.

DESIGNED BY USERS. JUST LIKE YOU!

We asked our customers what it is they want in the perfect notebook. The first thing they told us is that most notebooks look like a cigar box with a lid. They told us they wanted not only good looks, but things like great power *and* great battery life. Lightweight too, like five pounds and change. And the keyboard should be effortless to use. The entire product had to be extremely durable. And that was just for starters.

SL POWER. SL BATTERY LIFE. 64K CACHE!

We listened well.

Then we got down to work. For the chipset and CPU we selected the Intel 25MHz SL. We then built in a high-speed 64K SRAM cache as standard. We know this system might well replace a desktop for many users.

And power to your ZEOS Freestyle/SL system is provided by our advanced battery system. The fully enclosed lightweight battery packs easily snap in and out and can be quick-charged when the system is not being used or trickle-charged when in use. So what happens when the power is on?

GREAT VIDEO TOO.

You get great video! Because for video control, we chose the amazing new Cirrus Logic VGA controller. It not only consumes less power, it also produces the fast crisp images you're looking for. And with a business machine like this you'll also appreciate our dual display capabilities. You can connect an external VGA color monitor for simultaneous display. And that's not all.

Period.

A NOTEBOOK KEYBOARD YOU'RE GOING TO LOVE.

We re-designed and re-sculpted every key from scratch. Even the key-switch mechanism was invented anew. And we added the mouse key for easy cursor control. It is the

absolute perfect notebook keyboard. What else?

Lots else! Like the best display system of any notebook available anywhere. We listened here too. The screen is big and easy to read. Plus, it's high contrast and it's fast. It's also very easy to adjust. People said contrast and brightness knobs were hard to use. So we replaced them with soft touch buttons that *electronically* adjust screen settings at your command. Then we really got creative.

THE ONLY NOTEBOOK WITH A TILT & SWIVEL DISPLAY.

Can you imagine your desktop PC without a tilt and swivel display? Neither

could we. So why not incorporate that feature into a notebook. With the ZEOS Freestyle/SL notebook you can adjust the screen left and right as well as tilt it up and down. Now you can truly adjust your notebook screen to the perfect viewing angle.

IT FLOATS TOO.

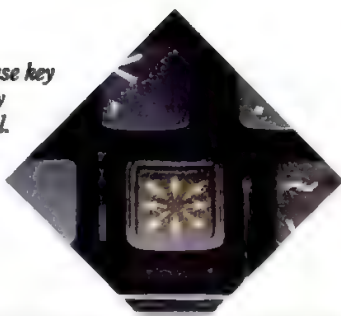
And then there is the "floating" screen. When you're facing your new ZEOS Freestyle/SL, the screen actually appears to "float" in the air in front of you. It's the only notebook that can really be used sitting on your lap!

EXTRA, EXTRA, EXTRAS. READ ALL ABOUT 'EM!

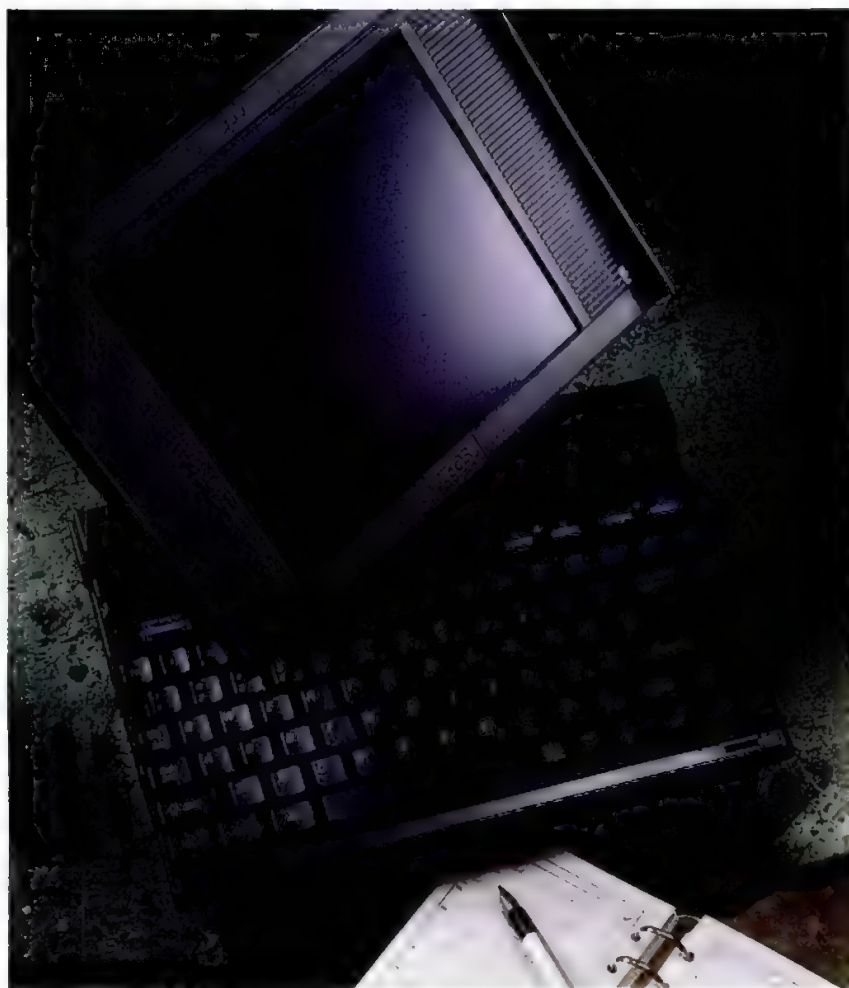
We've made more options available than ever before. Like our modem with send/receive fax. And memory up to 20MB, hard drives to 180MB, even an optional Italian leather carrying case! Extra batteries and a charging stand are available too. Call 800-554-7172 for all the details.

2MB, 60MB Only \$1895!

*Built-in mouse key
provides easy
cursor control.
Leave those
bulky mice
behind!*



*This sliding port door won't
break off or come loose.
Saves your fingers too.*



ZEOS. #1 RATED NOTEBOOKS, SERVICE & SUPPORT!

PC Magazine recently surveyed notebook users for their Service and Reliability issue. Their findings? "Only ZEOS portable PCs achieved significantly higher-than-average ratings in all four categories." The categories were reliability, future purchase plans, repair service satisfaction and technical support. And remember, ZEOS technical support is 24 hours a day, 365 days a year, toll free. And we back your new ZEOS Freestyle with our 30-Day Absolute Satisfaction Money-Back Guarantee, One Year Limited Warranty and more.

ORDER YOUR AMAZING ZEOS FREESTYLE/SL NOW.

Ordering your new ZEOS notebook is easy. Simply pick up the phone and give us a call. A friendly ZEOS Systems Consultant is ready to answer any questions you may have. You're going to love your new ZEOS notebook. Give us a call!

**CALL NOW TOLL FREE:
800-554-7172**

Purchase orders from Fortune 1000 companies, governments and institutions are subject to approval. Leasing programs are available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. ©1992, ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS). X202-PCM-9301B

NEW ZEOS FREESTYLE/SL ONLY \$1895

- Intel 25MHZ 386SL, 64K cachol
- 2MB RAM standard, expandable to 20MB.
- 60MB hard drive, options to 180MB, 3.5" 1.44MB floppy.
- Backlit 9 1/2" VGA display with Tilt/Swivel base. Simultaneous display with external VGA monitor.
- Snap-in and -out battery packs provide for a real 3-4 hours of typical operation or even longer depending on your applications.
- Quick-charge in little over an hour with the small lightweight AC adaptor.
- 8.5" x 11.3", 5.6 pounds, built-in soft carrying handle.
- 81-key keyboard with built-in full-size inverted "T" arrow keys.
- Serial, parallel and VGA ports with standard connectors protected by a durable, easy-to-use sliding door. No more broken doors or broken fingernails!
- 30-Day Money-Back Guarantee One Year Limited Warranty, ZEOS Customer Satisfaction Package.
- Loads of options. Modems, carrying cases and more!
- Designed and built by ZEOS right here in the USA.
- 24-Hour-a-Day Toll-Free Telephone Support, 365 Days a Year.
- Upgrade Packages Too: Call for details about absolutely loaded systems featuring more memory, bigger drives and Windows.

**ORDER NOW TOLL FREE:
800-554-7172**

Fax Orders: 612-633-1325
Government: 800-245-2449
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, Visa, Discover,
Am Exp, Z-Card.
Open 24 Hours a Day,
365 Days a Year!



"A wonder of small-scale engineering"

-PC Week
September 14, 1992

"The first mini PC with a keyboard large enough for serious typing"

-PC World
November 1992

"Blows the HP palmtop away"

-Computer Shopper
December 1992

ONLY \$595!

- CPU: Industry-standard NEC V30.
- Memory: 1 MB of RAM and 1.5 MB of ROM.
- Size: Only 1.3 lbs., 9 1/2" x 4 1/2" x 1 1/2"
- Power Supply: Two AA alkaline batteries and 2032 Lithium back-up battery, all included. Ten hours battery life with continuous use, even more in suspend!
- Preloaded Software: MS-DOS 5.0 system files, Microsoft Works 2.0 (word processing, spreadsheet, database and communications programs) and a personal organizer, planner, to do list, card file, information retrieval and calculator.
- I/O Ports: One serial, one parallel and two PCMCIA memory card connectors.
- Carrying case, cables and adapters included.
- Power Management: Automatic transition between active, doze and suspend modes.
- Screen: Easy-to-read 7" x 2 3/4", 640 x 200, 80 x 25 character display.
- Keyboard: 81-key with 12 function keys, embedded numeric keypad and special-function hot keys.
- Special Travel Kit only \$249! Comes with send/receive fax modem and communications software.

**ORDER NOW TOLL FREE:
800-554-7161**

Fax Orders: 612-633-1325

Government: 800-245-2449

Outside U.S. and Canada:

612-633-6131

Hearing Impaired (TDD):

800-228-5389

MasterCard, VISA, Discover,

American Express, Z-Card,SM

COD and Leasing Programs.

Open 24 Hours a Day,

365 Days a Year!

All prices and specifications are subject to change without notice. Please call for current pricing and warranty details. ZEOS is a publicly traded company: NASDAQ symbol: ZEOS. © ZEOS International, Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. All products and company names are trademarks or registered trademarks of their respective holders. PT2L-PCM-9301B



The World At Your Fingertips.

INTRODUCING A 1.3 LB. PCI SEND & RECEIVE E-MAIL AND MORE.

Imagine a portable PC that lets you send and receive e-mail, modem a memo to the home office, write reports, create spreadsheets, manage your calendar, calculate your expenses...*work non-stop for ten hours*...and is so portable that it weighs about the same as a notepad.

A futuristic fantasy? Not unless the future is now. It's the ZEOS[®] Pocket PC, and only ZEOS has it. You're going to love how portable and affordable it is. In fact, we think you'll find it's the one PC you'll want to take with you everywhere!

COMPACT YET COMPLETE.

At only 9 1/2" x 4 1/2" and only 1.3 lbs., what's great about the ZEOS Pocket PC is that it has a keyboard you can really use. If you're accustomed to typing with both hands, switching to a palmtop can be awkward because the keyboard only lets you type with one hand or even one finger. Yet the ZEOS Pocket PC's keyboard lets you use both hands easily, so you won't sacrifice comfort and speed for portability.

And even though it's small, the ZEOS Pocket PC carries a *full suite of industry standard software* already loaded and ready to go! You get Microsoft DOS 5.0 system files with built-in file transfer and Microsoft Works 2.0 with word processing, spreadsheet, database and communications programs. Plus, you get a personal organizer which includes a calendar/planner, "to do" list, business card file, information retrieval (for country codes, converting measurements and currency) and more. It's everything you need to manage your life!

Word processing, spreadsheet, database and communications programs...plus a personal organizer. All on an easy-to-read 7-inch screen with full 80x25 character display!

CIRCLE 036 ON READER SERVICE CARD

YOUR LINK TO THE WORLD.

Modem a memo to a client; send and retrieve your e-mail. With the Pocket PC's optional fax/modem, you can communicate worldwide. Plus, expanding the memory is another easy option—with an additional memory card that slips right into a slot on the system's underside. And that's not all.

IT JUST KEEPS GOING...

Ten hours of continuous use? Absolutely! All it takes is the two AA alkaline batteries included with your system. And your ZEOS Pocket PC has great power management, too—it automatically switches to the suspend mode when you take a break. Plus, when you turn off your system, then turn it on again, it goes right back to where you left off. What a time-saver!

FREE 24-HOUR TECH SUPPORT.

Questions about your purchase? ZEOS technical support is 24 hours a day, 365 days a year, and always toll-free. And we back every ZEOS purchase with our 30-Day Absolute Satisfaction Money-Back Guarantee, One Year Limited Warranty and more.

ORDER YOUR ZEOS POCKET PC TODAY. MAKES A GREAT GIFT!

Call us today at 800-554-7161. You're going to love the new ZEOS Pocket PC. *We guarantee it!*





John C. Dvorak

Privacy, Schmivacy

A guy walks up to me and says, "Dvorak, look!" as he pulls out a Motorola pager with a bright LCD screen. "I can get e-mail and messages wherever I go, hahahahaha!" Meanwhile, I'm reading announcements for new cellular and radio

modems to use in pocket computers so you can always be plugged in to your network.

There are plans to cover the globe with information satellites in such a way that, as someone from Motorola told me, "You can be climbing Mount Everest, and when you get to the top you can make a phone call to tell your wife that you're okay." More likely, though, is this scenario: You'll be paged or someone will call you as you climb the mountain. The call will probably be from your boss or some annoying coworker who's coordinating a meeting.

Isn't all this technology wonderful? Just think of how much more loved we will all feel if we can be pestered 24 hours a day, every stinking day of the year! Whenever your boss has the urge to bug you for some useless tidbit of information or for some ego gratification or to prove who is in control, he or she can ring you up! How marvelous. After all, we're all here on this planet to serve some master or another, aren't we? So let's hook up a bunch of gizmos to our bodies so we are never really out of the office.

The newest little superpager from Motorola—the one that downloads e-mail to the pager—comes with a little nerdy holster that latches on to your belt so you look as though you're carrying a phaser or some other device out of the science fiction culture. Let me tell you right off the bat: This getup looks as geeky as can be. But that's good because we may as well humiliate ourselves if we're going to be slaves to the company. Right?

These futuristic communicators are the amulets of today's submissive office workers. Here's a suggestion: Instead of being in a holster, this communicator should be worn around the neck...on a heavy chain.

Maybe I'm reading too much into all this, but I'm at the local supermarket the other day and I see a Hillary Clinton look-alike screeching some derisive message to her husband into a pocket phone as she pushes a shopping cart down the aisle. Can't she wait until she gets home to chew out the poor slob? Not in today's world of instant communication. Pocket phones, pocket pagers, pocket computers. It all reminds me of the old "Star Trek" episode where the entire population wears these rings of obedience around their necks that control everyone. The same theme is played out in another episode, where an implant keeps everyone in communication and under control. A repeating theme in "Star Trek: The Next Generation" has an entire race of people, the Borg, who are interlinked by a permanent implanted telecommunications network drilled directly into their brains. No Borg can think for himself or herself. It's the ultimate groupware. This vision is sick even in fiction. In reality, it's the logical end point (and goal) of our strident desire to be more and more plugged in.

Now I don't want to claim that pagers and pocket phones have no place in society. People like doctors who have to respond to emergencies obviously can and should use them. But what businessperson really needs life-and-death instant communication? What can't wait a day or even a week? Nothing, that's what. We'd all like to think that we're so important that we need to be in constant communication. How have we come to believe this? We've been sold on the notion that the one opportunity for success is fleeting. In fact, success is the result of an accumulation of hard work. It has little to do with missing that one phone call. Insecurity is what all these devices are about. Dump them.



Pocket phones, pocket pagers, pocket PCs. The desire for instant communication reflects our own insecurities.

Fast Windows Printing[™] at Your Fingertips

The future of Windows printing is here, and it's already sitting on your desk. LaserMaster's WinPrint[™] products use the power of your computer to provide the fastest, most advanced Windows printing features available today.

Revolutionary host-based design.

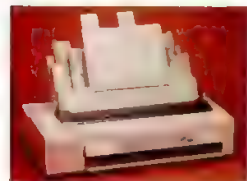
Unlike ordinary laser printers that require expensive processors and lots of extra memory to print your Windows pages, WinPrint products utilize the unused power of your '386 or '486 computer to process your Windows print jobs right in your CPU. This host-based architecture is faster than older printer designs, eliminates the need to download fonts, and makes adding new printing features as easy as loading new software.

The fastest Windows printing.

No other laser printer or printer upgrade can match the speed of our WinPrint products. Other printers have to translate Windows' GDI commands to a page description language before transmitting the print job to the printer via the slow parallel port. Our direct Windows driver uses GDI commands to rasterize the page in the host computer before sending it to the printer via our high-speed video cable. Ordinary printers make you wait minutes; we print in just seconds.



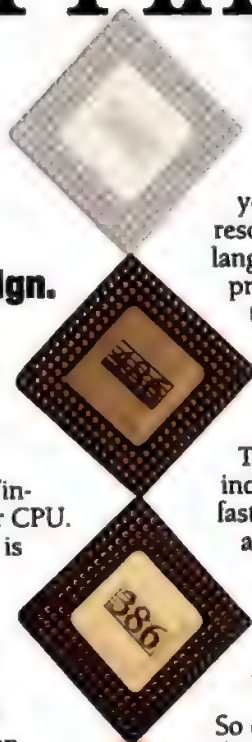
WinPrinter 600XL



WinPrinter 360XLS



WinJet 1200 Upgrade

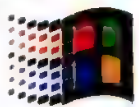


High-resolution, PostScript[®]-language printing.

Choose the PostScript-language mode and you can print your work with up to 1200-dpi resolution. Whether you need a fast, PostScript-language proofing device, a large-format business printer, or want to upgrade your HP[®]LaserJet[®]4 to provide camera-ready output, there is a WinPrint printer or printer upgrade to meet the needs of everyone on your network.

The future is at hand.

There is only one constant in the computer industry: computers will keep getting faster and faster. That's good news if you own a WinPrint product. Because it uses the power of the host computer, your WinPrint product is guaranteed to get faster every time you upgrade your computer.



MICROSOFT
WINDOWS
COMPATIBLE

So don't sink your money into a laser printer that's destined to become obsolete. LaserMaster's WinPrint products are the fastest, most versatile, most affordable way to print from Windows. Call LaserMaster today to learn more about the WinPrint advantage and to see how easy it is to put your hands on the WinPrint product that's right for you.

HP Printer Upgrades	Resolution	Maximum Paper Size	Fonts Included	Price
WinJet 1200*	1200 dpi	8 1/2" x 14"	50 TrueType	\$995
WinJet 800**	800 dpi	8 1/2" x 14"	50 TrueType	\$795
WinJet 300Si***	300 dpi	8 1/2" x 14"	50 TrueType	\$995
WinJet 300**	300 dpi	8 1/2" x 14"	50 TrueType	\$495
Windows Printers	Resolution	Maximum Paper Size	Fonts Included	Price
WinPrinter 800	800 dpi	8 1/2" x 14"	50 TrueType	\$1,595
WinPrinter 600XL	600 dpi	11" x 17" (A3)	50 TrueType	\$3,695
WinPrinter 360XLS	360 dpi	17" x 22" (A2)	50 TrueType	\$1,795

*Upgrades an HP LaserJet 4. **Upgrades an HP LaserJet II, IID, III, and IIID.
***Upgrades an HP LaserJet IIISL.

Making It Faster. Making It Better.

LM[®] LASERMASTER[®]
WINPRINT PRODUCTS DIVISION

1-800-365-4646 Dept28W

or 1-612-944-9330 Fax: 612-944-9519

©1992 LaserMaster Corporation, 6900 Shady Oak Road, Eden Prairie, MN 55344, (612) 944-9330. The LM logo and LaserMaster are registered trademarks, and WinPrint, WinPrinter, and WinJet are trademarks of LaserMaster Corporation. This product incorporates TrueImage v1 software with LaserMaster extensions for resolution and performance enhancement. HP and LaserJet are registered trademarks of Hewlett-Packard Corporation. TrueScript is a registered trademark of Adobe Systems, Inc. Windows and TrueType are trademarks of Microsoft Corporation. TrueType is a trademark of Apple Computer, Inc. All other product or brand names are trademarks of their respective holders. The WinPrinter 600XL is shown with optional paper trays. Specifications and prices subject to change without notice 10/92

John G. Dvorak

Inside Track

T

he **chip wars** saga continues with some amusing business practices by Intel aimed at chip cloners, especially Cyrix and its 486 clone. Apparently, top Intel executives have been going from vendor to vendor telling them they have to **pay a fee every time** they use a non-Intel chip. The fee is \$15 to \$25 a machine. The rationale used is that Intel has a patent on a method for generating memory pages and page tables for multitasking software. This patent, number 4,972,338, is called the Crawford patent after an Intel engineer. Allegedly, one of Intel's top executives has gone so far as to tell vendors that **Intel will "crush" Cyrix**, and their chips should be avoided.

Well, Cyrix wasn't too pleased by all this and sent out a press release **exposing the tactic**. Then they rushed to the U.S. District Court in Eastern Texas and filed a petition for a summary judgment to get Intel to cease and desist from this activity and **drop the threats**. According to the court document, Cyrix says that essentially, it has a license for the chip because of its association with Intel licensee SGS-Thomson, from which it obtains its chips. So, why should it have to pay a fee for something it has a license for? The interesting aspect is that **Texas Instruments is named** on the court document as an "intervenor." TI and Zenith Data Systems, among other big names, have been seriously designing around Cyrix chips. I'm amused by this situation and **wish the lawyers** all the luck in the world. They'll be the only winners.

Once Bitten Dept.: I'm sure a lot of you noticed, as I did, that out of the clear blue sky **Microsoft re-named Windows NT** Windows NT 3.1! Now, since Windows NT is a new product, you'd think it would be 1.0 (whenever it's released). I suppose there are lots of marketing rationales for pulling this **wacky number** with a beta product. A friend of mine suggests that perhaps Microsoft is playing some **legal hanky-panky** with a competitor (or maybe even a partner). Remember when Microsoft was **sued by Apple** for violating a license to copy aspects of the Mac interface? The suit said that Microsoft only had the license for Version 1 of Windows, as if it could never be improved. In fact, if Microsoft had forever upgraded Windows and never changed the name from Windows 1.0, the nearly disastrous Apple suit may never have occurred. Is something similar up with this NT 3.1 thing?

My friend asked me, "What if Microsoft had a contract with Novell (originating back when Windows 3.0

***Allegedly, one of Intel's
top execs told vendors
it will "crush" Cyrix.
Now, Intel wants a fee
from vendors who use
non-Intel chips, and
Cyrix, displeased,
has rushed to U.S.
District Court.***

was big) that specified that Microsoft had nonroyalty rights to Novell code *only* for Windows 3.1, and that rights to other versions of Windows would need to be renegotiated based on the success of Windows 3.1? The higher the sales of Windows 3.1, the **lower the royalty rate** for future products. Then, Microsoft's labeling of Windows for Workgroups 3.1 and Windows NT 3.1 and the dispute between Novell and Microsoft would all of a sudden make a lot of sense."

It's a wonderful business!

New Age Marketing Dept.:

I've heard some wild ideas, but none so amusing as the OS/2 grass roots marketing efforts, including a **stunt IBM** (or some OS/2 fanatics) pulled in Boston during the OS/2

conference there. In a *PC Magazine* CompuServe forum, Frank R. Field revealed that someone had supplied the Red & White Cab Association of South Boston with **cab receipts plugging OS/2**. On the back of the receipt is the IBM logo and the slogan "OS/2... one million copies and going strong." Sounds like a collector's item to me.

We Get Mail Dept.: I ridiculed the concept of using Windows on a washing machine and immediately got this futuristic retort from Edgar E. Geithner:

Nope, no one I know needs Windows on their washing machine. But wait! How about a CDMA network of appliances in your home? It's true. The network would use the Electronic Industries of America Consumer Electronic Bus (CEBus), and communicate over the AC power lines in your home. It would connect, through a smart electric meter, to the electric company's lines. That lets an electric company send rate information to a smart, say, washing machine. The machine would let you decide whether you want to wash your dainties now, when the electric rates are high, or later, when they're cheaper. The same applies to hot water heaters, dishwashers, heat pumps, etc. At least one company has the meter, and there are a number of demo houses being built to test the concept. And if you have a network, can terminals on appliances be far behind? Maybe we need Windows for toasters after all.

Something to look forward to. Not!

Genuinely Interesting Software Dept.: Sick of the government? The latest trend in software is **whine broadcasting**. Federal Soapbox is a \$129 database, editor, and research tool that allows you to **scorch the earth** with complaints to your representatives. Included with the program is a **graphic flow-chart** of the entire U.S. Government, staff listings, and fax numbers. Hot idea. Contact Soapbox Software in San Rafael, California at 800-989-7627. □

THE COMPAQ PROSIGNIA PCs THE SAME IMPACT AS OUR R

Not long ago, we introduced PCs that established us as the new leader in affordable computing. To that we now add the COMPAQ ProSignia Family of PC Servers: delivering a new level of performance, affordability and support by establishing a new class of PC servers.

Ironically, the more critical your PC network becomes, the more likely your network server will prove inadequate.

The faster you need something, the slower it delivers. When it's time to upgrade or expand, you find yourself at the technological equivalent of a dead-end street.

Which, needless to say, can be a problem.

What you need is an easy-to-manage system offering high performance, flexibility and extended

support. All at an exceptional price.

In other words, a breakthrough.

In still other words, the new COMPAQ ProSignia.

PROCESSORS: chip upgradable 486/33 or 486DX2/66 **EXPANSION:** 7 32-Bit EISA bus master slots **STORAGE:** over 6GB internal in 8 bays **HARD DRIVES:** Fast-SCSI-2 (330MB, 550MB, 1.05GB), Drive Array Pairs (680MB, 1.02GB), IDE (210MB, 340MB, 510MB) **DRIVE CONTROLLER:** Integrated or optional 32-Bit Fast-SCSI-2, IDA-2, or Integrated IDE (on models 1/EL and 340/W) **NETWORK CONTROLLER:** Preinstalled 32-Bit NetFlex Controller **SERVER MANAGEMENT:** INSIGHT Server Management Framework **RAM:** 4-128MB of industry-standard SIMMS **WARRANTY:** Free three-year, parts and labor, on-site** warranty **SUPPORT:** Free 24-hour, 7-day hardware support, optional multi-vendor network operating system support.

For starters, the COMPAQ ProSignia 486/33 outperforms comparably configured IBM and Dell servers by 83% and 64%, respectively.* (Both of which, by the way, are much more expensive.)

In not-so-simple terms, here's how we did it:

COMPAQ ProSignia disk-configured models come standard with an all-new 32-Bit Fast-SCSI-2 Controller that performs twice as fast as old SCSI technology. As well as a preinstalled, COMPAQ 32-Bit NetFlex Controller that works with Ethernet or Token Ring. And for those who require truly

©1992 Compaq Computer Corporation. All Rights Reserved. COMPAQ Registered US Patent and Trademark Office. ProSignia, NetFlex and CompaqCare are trademarks of Compaq Computer Corporation. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies. *Results from running PC Week File Server Shootout test. All products with 16 MB of RAM. COMPAQ ProSignia with integrated 32-Bit Fast-SCSI-2 Controller and four 550MB Fast-SCSI-2 Hard Drives. Dell PowerLine 450SE with Dell SCSI Controller and four 650MB SCSI Hard Drives. IBM PS/2 XP486/50 Model 95 with IBM SCSI Controller and four 400MB SCSI Hard

SERVER. WE EXPECT IT TO HAVE RECENTLY INTRODUCED PCs.

extraordinary capabilities,
we offer an optional 32-Bit
IDA-2 Controller.

All of which means it
takes a lot less time to get
a lot more done. No more
waiting for files. No
more staring

blankly
at a com-
puter
screen that
stares just as
blankly back.

The COMPAQ
ProSignia is also the
first affordable PC server
incorporating advanced
management technolo-
gies. Included is a set of
simple-to-use features
that not only help you

maintain better control
over your entire network,
but can also anticipate,
and help prevent, poten-
tial problems.

The simple translation:
Fewer headaches. For you.
For users. Forever.

We've even turned

up the volume on our ser-
vice and support program.
You get a full three-year,
on-site**limited warranty,
as well as 24-hour-a-day,

7-day-a-week technical
support. Free.

CompaqCare also now
includes our optional Ad-
vanced Network Support
Agreement, a comprehen-
sive selection of systems-
related support services
that can be customized
to meet your needs.

To learn how easy it
is to get up and
running, just call
1-800-345-1518
in the U.S., or
1-800-263-5868
in Canada.

You'll find out why
the COMPAQ ProSignia
represents such an excep-
tional value. And why it
will undoubtedly make a
big impression. On the
marketplace, and on you.



The COMPAQ ProSignia starts at under \$2,700 and is designed, tested and certified to run NetWare flawlessly. We even offer NetWare from Compaq to optimize server management capabilities.*



*With only industry-standard technolo-
gies and an easy-to-upgrade processor
path, the COMPAQ ProSignia provides
a cost-effective way to meet today's
needs today. And tomorrow's tomorrow.*



Drives.**This service, provided by Contracted Service Providers, is specific to hardware products and may not be available in certain geographic locations. Consult the Compaq Customer Support Center for details. *Suggested retail price, reseller price may vary; price indicated is for non-disk-configured COMPAQ ProSignia 486/33 Model 1/EL, not pictured here; monitor, NetFlex Controller not included. Models including hard drive and NetFlex Controller start under \$4500. The Intel Inside logo is a registered trademark of Intel Corporation.

CIRCLE 308 ON READER SERVICE CARD

Introducing a printer for incompatible couples.



*The Model 97 combines
NEC's microfine toner
and Sharp Edge
Technology to
provide superior print
quality. It also
includes a built-in
envelope feeder and
uses a single-piece,
eight-thousand-
page consumable
cartridge.*



The NEC Silentwriter® Model 97

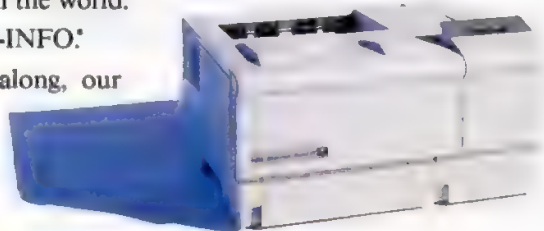
An NEC Silentwriter® Model 97 can make peace between the PC and Mac® computers in your office.

Because our 10ppm laser printer connects with both simultaneously, several users can print automatically with no operator intervention required.

Equipped with Adobe's PostScript™ Level 2 software and HP LaserJet III (PCL5) emulation, it's compatible with DOS, Macintosh® and Windows™ applications. And at \$2149, it's surprisingly affordable. You can also add PostScript Fax capabilities to send and receive *original quality* documents or conventional faxes anywhere in the world.

So give us a call at 1-800-NEC-INFO.*

If your computers can't get along, our Model 97 can keep them working together happily ever after.



Because  is the way you want to go. **NEC**



*Or call NEC FastFacts™ at 1-800-366-0476 #SWM97 In Canada call 1-800-343-4418

Silentwriter is a registered trademark of NEC Corporation. FastFacts is a trademark of NEC Technologies, Inc. All other trademarks and registered names are the property of their respective owners. D8824P1A055241 © 1987 NEC Technologies, Inc.

CIRCLE 217 ON READER SERVICE CARD



Jim Seymour

Making Multimedia Work

I need to come up for air. For the past few months I've been immersed in multimedia PC issues—products, languages, and ideas we haven't had to deal with in the PC world until now. And I need a breather.

I came to multimedia, in the PC sense, as a nonbeliever. I thought the term *multimedia* itself bogus, for under it was subsumed a whole range of so-called "technologies"—many of them better described as techniques, or maybe just notions. All were so loosely defined and so casually interrelated that most who used the term bent it to his own idiosyncratic meaning.

After several months of hard work with those tools and ideas, I am now, well, a semib believer. I see what you can do with them. I have *done* what you can do with them. It's sometimes fun, sometimes appealing. But only sometimes useful. And there's the rub: What to do with it?

At first I thought PC multimedia was going to be the next playtoy of the corporate training department. Forgive me, but as a class—and I acknowledge that there are stellar exceptions—corporate training departments are the Land of the Living Dead: sumps for human time and effort and for great gobs of corporate cash. Like many other whizzy toys before them—in-house interactive laserdisk programming for employee training comes first to mind, but the list is a long one—PC multimedia tools seemed ideal for the training people, who would fritter away endless amounts of time using multimedia to produce self-paced tutorials on finding the bathrooms on your floor. "Are you a male? Click here. Are you a female? Click here. Thank you! BEEP!" Things like that.

No doubt corporate trainers will latch onto multimedia; some already have. But it offers far greater potential than that. PC multimedia can revitalize some parts of our nearly moribund primary and secondary education systems, for example. And it has legitimate uses in business.

But finding those legitimate uses, and then using the appropriate parts of that basket of tricks collectively known as multimedia to serve them, is not easy. It requires a hard-headed analysis of what people really need, how they like to receive information, and which tools you can afford and master.

What Compaq and Microsoft are calling "business audio" is the most immediately useful business application of multimedia tools. Voice annotation of files, for example, offers real value. Adding a few comments to a spreadsheet cell is the most obvious example. Anyone who's passed around iterations of budget worksheets, leading up to that final one that goes to The Boss, knows how useful it is to add little snippets of explanation to the working drafts.

LOSE THE POST-ITS

Some of us do the above now with the annotation text boxes of Windows spreadsheets. Others do it with Post-it notes stuck on printouts of those drafts. But the routine for drawing little boxes is time consuming, and doesn't help those in the loop who are still using character-oriented spreadsheet programs. And the latter are prone to loss: Random Post-it notes that fall off printouts have little value.

By contrast, inserting a sound icon in a cell and then speaking a few words into a microphone stuck on the front of your monitor—"The western region projections look too high," or "I increased the Atlanta lease figure because when the current lease runs out in February, they're going to hit us with a 20 percent increase"—is far more effective.

Voice annotation isn't only useful for worksheet files you're going to circulate to others. Good



A skeptic discovers some real uses for multimedia. This time, he's not just talking to himself.



With transfer rates up to 36 megabytes per minute and access times faster than 30 seconds, 3M 1/4-inch data cartridges give you a fast, practical, proven reliable choice for data backup. When you need to save the day in minutes, look to the fastest growing backup media—one that's growing to 10 gigabytes and beyond. Find out more. Call 1-800-888-1889, ext. 54.

Save the day.

In minutes.



CIRCLE 167 ON READER SERVICE CARD

Jim Seymour

spreadsheet practice requires documenting your assumptions so that six weeks or six months later, you can remember what those numbers were based upon. But I confess I rarely have time to do that.

As a result, I have too many old but still-useful worksheets on my PC in which my assumptions—and, therefore, the sheets' meanings—are long lost. But now as I read those sheets into Excel, convert and save them in .XCL format, I attach a quick voice annotation to cells where I may later wonder about my premises.

I'll concede that leaving audio notes for yourself may seem pretty dorky at first, but not for long. You'll soon get hooked.

One problem remains in using voice annotation: the input and output device. For flashy multimedia productions, certainly you need high quality audio input at one end, and good amplified speakers at the other. (More on that, soon.)

But for recording audio notes or listening to them, the hand-held microphones and Walkman-style headsets offered with too many PC sound boards are as unnecessary as they are embarrassing in an office. Instead, we need to be able to use that simple, ordinary, ubiquitous hand-held audio input and output device we already have on our desks: the telephone handset. Indeed, the biggest obstacle to wider use of PC audio isn't conceptual or technical, but behavioral: Who wants to be seen playing Disco Danny at our desks with these things? We want to simply pick up the phone and speak or hear voice messages in documents.

Yet I've never seen a sound board with the simple adapter—or actually, the simple two or three adapters—needed to work with the phones on our desks. When those gizmos arrive, so will wider use of PC audio.

Audio annotation may sound pretty tame. Some multimedia mavens would argue that just adding audio to an existing computer file doesn't really qualify as multimedia. But it's the simple, immediately useful applications of new technologies and new ideas that get adopted first and lay the foundation for wider, more complex implementations to follow.

Look for more columns here, from time to time, on the issues and practicalities of PC multimedia. It's not for everyone; it's not going to be ubiquitous; and it involves some messy new problems. But it's worth it: Multimedia is a useful toolkit for communicating effectively with others.

And sometimes, with yourself. □

**GET NONSTOP
SYSTEMS
INFORMATION...
AND 2
DISKS —
FREE!**



Subscribe to PC Magazine now and you'll also get the "Best of PC Magazine's Utilities" on 2 disks — **FREE** with your paid subscription! These exclusive power programs are guaranteed to enhance your DOS, video and printer capabilities at the touch of a key!

ONE YEAR
(22 issues) for \$29.97.
YOU SAVE 54%!*

TWO YEARS
(44 issues) for \$49.97.
YOU SAVE 62%!*

Call toll-free today: 1-800-289-0429

Full one-year subscription price is \$44.97. Please add \$52 per year for postage outside the U.S. U.S. currency only. Canadian GST included. Please allow 30 days for delivery. Your disks will be shipped upon payment.



CHAOS.

SyDOS.

THE ONLY STORAGE SYSTEM YOU NEED!

Go ahead. Add all the storage upgrades your system can handle. You'll *still* wind up with a seriously limited solution, and in a tangle of confusion. In a word, chaos.

Or you can have the only storage system you will ever need—SyDOS. SyDOS removable cartridge disk drives provide unlimited storage capabilities for all PCs—and compatibles.

Unlimited Capacity. SyDOS uses proven Winchester technology in removable 44MB or 88MB cartridges, allowing unlimited storage.

Better Than Fixed Drives. Unlike fixed hard drives which limit your capacity, you get unlimited capacity with the same reliability and performance.

Faster Than Tape. You can backup as much as 88MB in as little as 8 minutes with no special software to learn. And, your data is readily available because there's no time wasted restoring archived tape files.

Superior To Optical. SyDOS removable cartridge disk drives deliver 20 m/sec. seek times while optical drives can take more than 3 times as long to access data. And SyDOS drives are much less expensive than optical drives!

Higher Reliability Than Floppy. SyDOS uses rigid thin film media rather than the fragile, flexible media which can wear and put your data at risk.

Unlimited Options. You can buy your SyDOS solution with the host adapter to meet your needs: High Performance 16-bit; Enhanced Performance 16-bit; Standard 8-bit; Micro Channel® or Parallel Port. Or choose a

SyDOS Special Value Package which includes everything you need to get up and running: drive, cartridge, host adapter, cabling, manuals and installation software.

Unsurpassed Warranty. SyDOS drives come complete with a 2-year warranty on the drive and 5 years on the cartridge.

So whether you need additional storage, high-speed backup, easy data organization and transportation or data security, take a look at SyDOS—the optimum solution without the confusion. Find out why SyDOS is the only storage system you need. **Call 800-43SYDOS.**



SyDOS™

A Division of SyQuest Technology

6501 Park of Commerce Boulevard, Suite 110
Boca Raton, Florida 33487
1-800-43SYDOS

©1992 SyDOS
SyDOS is a registered trademark of SyQuest Technology. Micro Channel is a registered trademark of International Business Machines Corporation. Micropolis, Maxtor, Bernoulli, Conner, Fujitsu, Panasonic, Colorado and Everex are registered trademarks of their respective companies.

CIRCLE 279 ON READER SERVICE CARD

Single System.



*Active Matrix
Color system also
available for only
\$3799. Features
512 colors, plenty of
contrast and superior
video response.*

Now you can make your computing investment work twice as hard with the Northgate® ZXPortable™.

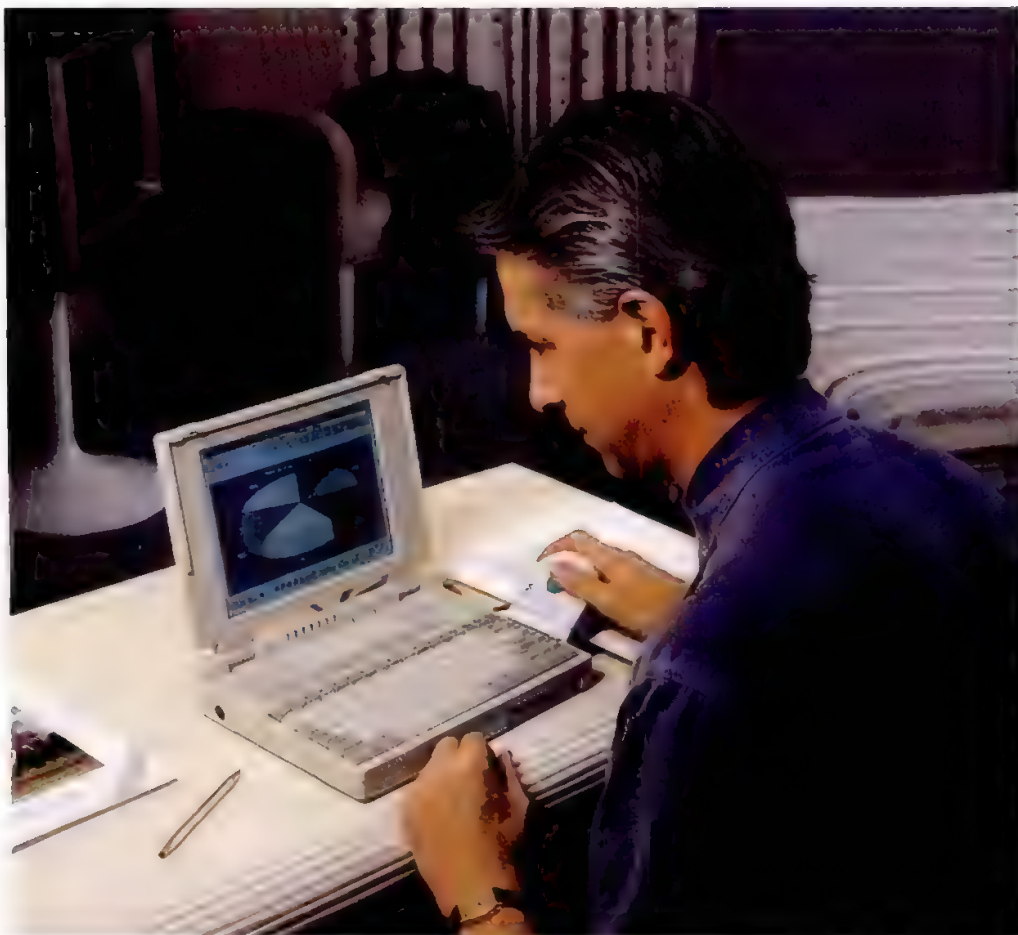
At first glance, this powerful solution looks like a desktop computer. And it is ...complete with 486SX™/25 power and performance. But take a closer look. The heart of this system is actually an 8.5" x 11" notebook computer.

This insightful "two-in-one" engineering is ideal for corporate settings. The 486SX/25 power speeds you through the most demanding applications.

You get exceptional connectivity as well, letting you take full advantage of your existing network.

© Copyright Northgate Computer Systems, Inc., 1992. All rights reserved. Northgate, ZXPortable, and the Northgate 'N' logo are U.S. trademarks or registered U.S. trademarks of Northgate Computer Systems. 80486SX is a U.S. trademark of Intel. MS-DOS, Windows and Microsoft are U.S. trademarks or registered U.S. trademarks of Microsoft Corporation. All other products and brand names are U.S. trademarks and registered U.S. trademarks of their respective companies. Prices and specifications subject to change without notice. Prices shown do not include shipping/handling charges and appropriate sales taxes. Northgate reserves the right to substitute components of equal or greater quality or

Double Duty.



When business takes you out of town, simply slide the ZXPortable out of the docking station and take it with you. The quick, 120MB hard drive gives you excellent storage capabilities – even for Windows™ OS/2® and other complex operating systems.

Select our popular \$1999 monochrome system, or our Active Matrix Color model priced at an incredibly-low \$3799. Either way, you'll enjoy sharp, 640x480 video and Advanced Power Management benefits. Docking Station prices begin at just \$599 including 5.25" floppy drive.

Call now and we'll explain all the other advanced features and service and support policies that made Northgate a leader.

Call For More Information 800-345-0259

Major corporations, volume purchasers and government agencies call National Business Accounts: 800-345-0137

GSA #GS00K91AGS5193 PSOI

Major Credit Cards, money orders, direct wire and approved company purchase orders accepted.



"Solutions For Workgroups"™

7075 Flying Cloud Drive, Eden Prairie, Minnesota 55344

performance: All items subject to availability. We support the ethical use of software. To report software copyright violations, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-388-PTR8. All systems shipped with DiagSoft™ QA Plus™ software. *Monthly lease payments are based on a 36-month standard fair-market value open-ended lease. 12-60 month leasing options available for qualified businesses.

COREL SCSI!

The Best Software to Connect PC Peripherals



Connect up to Seven Peripherals!

It's easy! Add all the SCSI devices you need to your system. CorelSCSI makes it simple and inexpensive. CorelSCSI provides you with all the software you need to install and manage all your SCSI devices including: CD-ROM drives, rewritable and WORM optical drives, hard drives, jukeboxes, tape drives, and many more.

► Universal Compatibility

CorelSCSI software works with major SCSI host adapters including: Adaptec, Always, BusLogic, D.P.T., and Future Domain. CorelSCSI will allow installation of SCSI devices on DOS, Windows or OS/2 systems. CorelSCSI software will even allow you to set up CD-ROMs, optical drives or jukeboxes on your NetWare* file server!

* Novell Netware 386 v3.1 and higher.

► Value Packed!

CorelSCSI software includes bonus programs and utilities such as CD-Audio, Corel Tape Backup software, and complete diagnostic tools.*

► Super Installation!

CorelSCSI software is quick and easy to install and will get you up and running immediately. CorelSCSI will ask what devices are connected and install the correct drivers automatically.

If you have CD-ROM drives, tape drives, or any other SCSI devices, you need CorelSCSI!

\$99 (US)

suggested list price

"With its low cost and vast array of device support, CorelSCSI provides a great new way for PC users to make easier peripheral connections."

M. Keith Thompson, PC Magazine, June 1992

Compatible host adapter companies:

adaptec
Where you're serious about SCSI

DPT

aa always
technology

FUTURE
DOMAIN

buslogic



Look for the
CorelSCSI
Approved
Product logo.



1-800-836-SCSI

CDN TEL: (613) 728-8200 FAX: (613) 761-9176

CIRCLE 011 ON READER SERVICE CARD





Bill Howard

Local Bus: The Better Video Choice

Specify industry-standard, accelerated local-bus video if you want to get maximum performance from your next PC. This technology is likely to produce a tenfold improvement in video speed compared with your two-year-old PC's.

To get the fastest video, look for three elements: a *local-bus connection* with a nonproprietary, *industry-standard interface*; and a video adapter with *fixed-function graphics acceleration techniques*.

The local-bus concept is deceptively simple. By letting the bus run as fast as the CPU, you speed up whatever you attach to that bus. Most video cards plug into the ISA (Industry Standard Architecture) bus, which transfers data at 8 MHz. That was fine in 1986, when the CPU in a PC AT ran at 8 MHz. Now that the CPU can run at 50 MHz, the ISA bus is woefully inadequate. RAM has long since been transferred from the ISA bus to a dedicated, 32-bit memory bus that runs at the CPU's speed. The local bus works the same way.

Right now there's one local-bus standard, the VESA VL-Bus from the Video Electronics Standards Association. Another, Intel PCI (Peripheral Component Interconnect), is due from Intel in 1993. PCI may be faster and more sophisticated. But VL-Bus is here, it works, and vendors are building video cards for VL-Bus PCs you can buy now. The VESA connector is a 32-bit extension to a 16-bit ISA connector.

A half-dozen PC makers who couldn't wait for an industry-standard bus jumped on the local-bus concept with proprietary designs last year. They're passably fast and, theoretically, upgradable. But they'll probably be orphaned as PC vendors switch to VL-Bus or PCI. As you probably know from reading *PC Magazine's* video card comparisons (most recently, "Video Technology: Making a Choice in an Era of Change," January 12, 1993), video accelerators give you the performance of a \$1,000 coprocessed video card for little more than the price of a frame-buffer card. Video acceler-

ators are programmed to do in a hurry many of the display operations in Windows, OS/2 or AutoCAD: draw a line, fill an ellipse with red, move a crosshatched box. How well the accelerator handles these routines, and how many it handles, determines the adapter's speed—much more than which bus it's on.

On the other hand, the preprogrammed accelerator routines won't speed up the display of randomly patterned images such as the company logo on your memo form or a scanned photo for your departmental newsletter. Random routines respond to the brute force of a high-speed bus and a fast CPU.

That's why *accelerated, local-bus video* is a winner: You're covered no matter what you're working with. And if it's an industry standard, you'll be able to upgrade as the technology advances.

WHY NOT EISA

What about EISA and Micro Channel architecture buses? Though both are 32 bits wide to ISA's 16 bits, the bus speed is only marginally faster. So far, desktop PC designers have supplemented, rather than abandoned, the ISA bus to increase the speed of other components.

Memory resides on a separate bus; now video has VL-B and PCI. In the near future, look for local-bus SCSI controllers and network adapters. As Intel vice president Dave House notes, in the war between Micro Channel and EISA, ISA won.

Two final points: A local-bus 486DX/50 should outperform a local-bus 486DX2/66 because the clock-doubled DX2/66's local bus stops at 33 MHz. This year you may see local-bus, EISA PCs for no more than \$150 more than ISA systems. At that price, EISA desktop PCs are worth considering. □



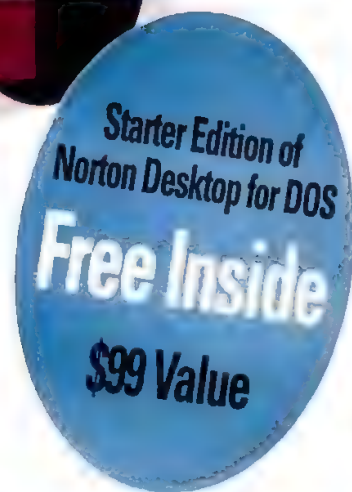
How to speed up Windows video performance: Put it on the local bus, then accelerate.

Not since Cracked inside a box be

For a limited time, when you upgrade to 1-2-3 for DOS Release 2.4 or 3.4, you'll get the Starter Edition of the Norton Desktop free inside.

Strip off the plastic wrapper, rip open the box, and inside you'll find something almost as exciting as a secret decoder ring or mini-magnifying glass, and certainly worth a lot more: the Starter Edition of Symantec's Norton Desktop™ for DOS (a \$99 value*).

The Starter Edition includes the Norton File Manager and the Norton AntiVirus®. Critics have praised the Norton File Manager for the way it swiftly organizes huge amounts of files. With its visual "drag-and-drop" interface, you can delete files, copy or print files, view multiple directories, or



Lotus 1-2-3 for DOS

The world's most popular spreadsheet

Cracker Jack® has a prize even so appealing.

backup and scan files for viruses. All with the point and click of a mouse. And the acclaimed Norton AntiVirus detects and eliminates over 1000 known viruses. Viruses that have been known to cause some major headaches in corporate America.

Of course, The Norton Desktop Starter Edition is only part of a bigger reward: 1-2-3® for DOS Release 3.4.

Introducing Release 3.4. The spreadsheet that moves as fast as you do.

If you're looking for a spreadsheet that can keep pace with your workload, consider the new 1-2-3 for DOS Release 3.4. This advanced DOS spreadsheet takes analyzing numbers to a new level. Release 3.4 is 22% faster overall. It loads faster, prints faster, recalculates faster and displays your work faster. All of which means you can work faster.

Plus, we've made it easier than ever to use—with over 75 SmartIcons which give you one-click shortcuts to your most commonly used spreadsheet commands. And, the only true 3D DOS spreadsheet, 3.4 makes it simple for

you to organize and consolidate data. Plus, with DataLens® you can use familiar 1-2-3 commands to access external databases.

Why 1-2-3 is the leading DOS spreadsheet.

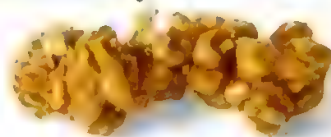
Only 1-2-3 for DOS offers true compatibility with all other versions of 1-2-3 across all major platforms.

And Releases 2.4 and 3.4 give you such unique 1-2-3 features as file Viewer Auditor, print compression and Backsolver—a quicker, more efficient goal-seeker. But more importantly, 1-2-3 for DOS is used and trusted by 18 million people worldwide.

How to get your free prize.

To take advantage of this special offer from Lotus® and Symantec®—two leading companies dedicated to making the most of your DOS computer—visit your Lotus Authorized Reseller or call **1-800-TRADEUP, ext. 7276** by March 31st, 1993.

And get in on what may be the second most popular free offer in history.



Lotus 1-2-3 for DOS

*Suggested retail value. Offer expires 3/31/93 or while supplies last. ©1992 Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142. All rights reserved. Lotus, 1-2-3 and DataLens are registered trademarks and SmartIcons is a trademark of Lotus Development Corporation. Symantec is a registered trademark and the Norton Desktop and the Norton AntiVirus are trademarks of Symantec Corporation. Cracker Jack is a registered trademark of Borden Inc.

STRIPPED DOWN NOT STRIPPED

DIMENSION
486SX/25

\$1,499

Lease \$55/MO

i486 SX 25 MHz System
4 MB RAM
170 MB + 17 ms Hard Drive
5 Drive Bays + 6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Super VGA 1024i Monitor
(14", 1024 x 768, 28mm)
MS-DOS 5.0/Microsoft Windows 3.1/
Mouse

DIMENSION
486DX/33

\$1,999

Lease \$74/MO

i486 DX 33 MHz System
4 MB RAM + 64 KB Cache
170 MB + 17 ms Hard Drive
5 Drive Bays + 6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Super VGA 1024i Monitor
(14", 1024 x 768, 28mm)
MS-DOS 5.0/Microsoft Windows 3.1/
Mouse



WIN PRICES, DOWN 486s.



**DIMENSION
486DX/33**

\$2,199

Lease: \$81/MO.

i486 DX 33 MHz System
4 MB RAM
64 KB Cache
212 MB (15 ms) Hard Drive
5 Drive Bays
6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Ultra VGA 1024Ni Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

**DIMENSION
486DX2/50**

\$2,399

Lease: \$89/MO.

i486 DX2 50 MHz System
4 MB RAM
64 KB Cache
212 MB (15 ms) Hard Drive
5 Drive Bays
6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Ultra VGA 1024Ni Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse



**DIMENSION
486DX/33s**

\$2,499

Lease: \$92/MO.

i486 DX 33 MHz System
8 MB RAM
64 KB Cache
212 MB (15 ms) Hard Drive
6 Drive Bays
6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Ultra VGA 1024Ni Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

**DIMENSION
486DX2/50s**

\$2,699

Lease: \$100/MO.

i486 DX2 50 MHz System
8 MB RAM
64 KB Cache
212 MB (15 ms) Hard Drive
6 Drive Bays
6 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
Accelerated Video (512 KB Video RAM)
Ultra VGA 1024Ni Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

Our major competitors are so desperate to drop their prices to match ours, it makes you wonder what else they may be dropping.

Standards? Quality? Features?
Who knows?

We think you're better off with the i486 system you really want, at the price you really want.

We can give you the Dell[®] Dimension[™] 486 series — as well as 386 and notebook systems — at lower prices without sacrificing features or quality. Because we deal directly with our customers, cutting out the middlemen our competitors use.

Each Dell Dimension system is manufactured to our exacting standards, and fully backed by the fastest-growing PC company in the FORTUNE 500[®]. Just like every one of the over half-million systems we shipped over the last twelve months.

So call Dell. Our prices may be low, but our computers aren't cheap.

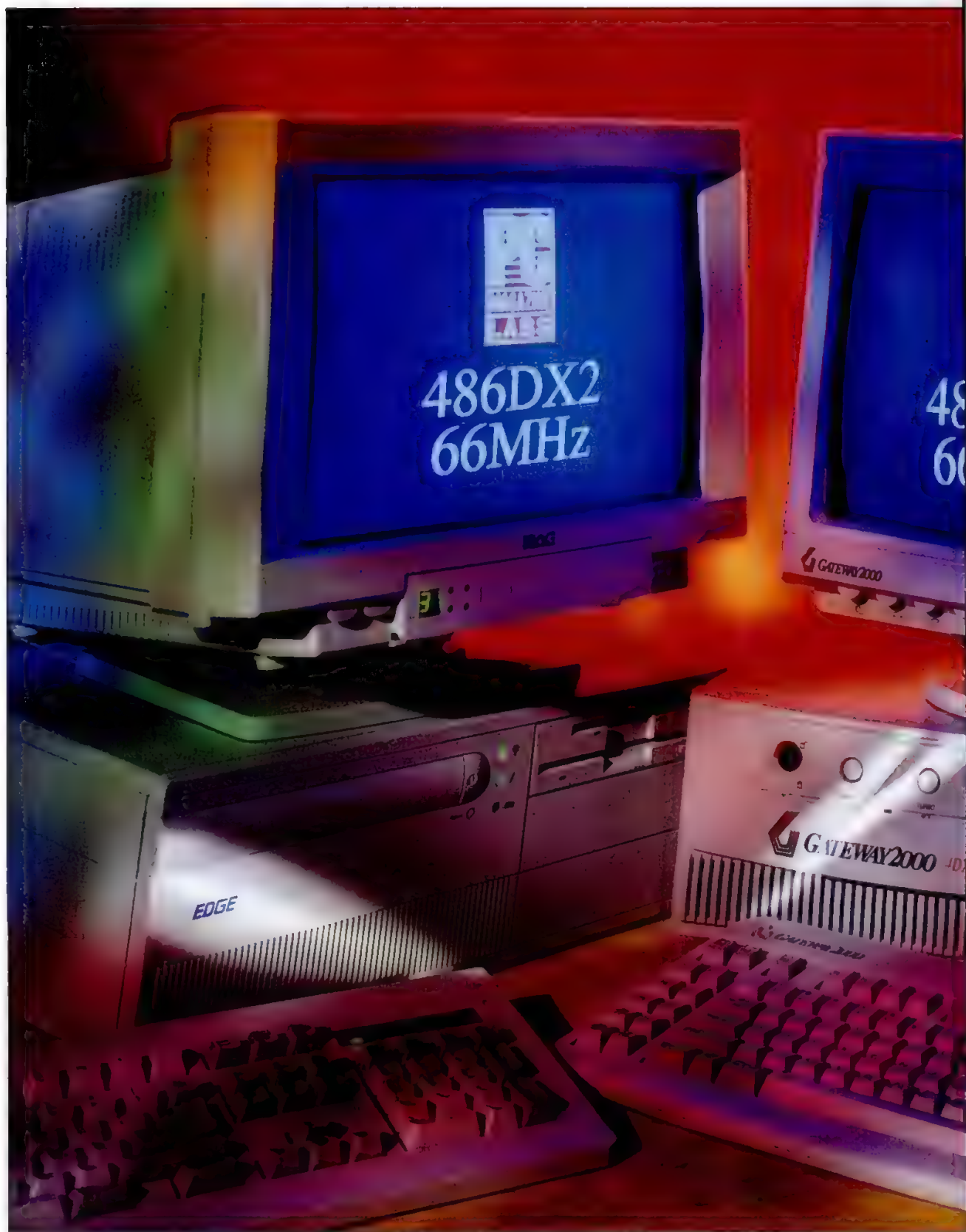
DELL[™]

800-388-1760

WHEN CALLING, PLEASE REFERENCE #11BCF

HOURS 7AM-9PM CT MON-FRI 8AM-4PM CT SAT 10AM-3PM CT SUN
IN CANADA CALL 800-668-3021

*Leasing arranged by Leasing Group, Inc. i486 is a trademark and the Intel Inside logo is a registered trademark of Intel Corporation. MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. FORTUNE 500 is a registered trademark of The Time Inc Magazine Company. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.



WINDOWS WORKSTATIONS

DX2/66: The New Speed Limit

Fastest of the fast, Intel's 66-MHz 486DX2 processor has taken personal computing to previously unthought-of speeds. *PC Magazine* tests 74 of today's swiftest PCs in search of the ultimate Windows workstation.

Once, not so very long ago, a now-departed *PC Magazine* staffer wrote here of a new generation of PCs, "They're so fast they'll leave skid marks on your desktop!" The machines? The first 12-MHz 286s.

Sic transit gloria.

PC buyers' thirst for power may not be endless, but it's clear we haven't yet even approached satisfying it. The need for speed is driven not only by that inevitable human itch for more, but also by the nature of the work we undertake on PCs. Graphical user interfaces, as in Microsoft Windows 3.1 and OS/2 2.0, suck up enormous amounts of power. The very nature of windowing environments encourages us to leave open several applications simultaneously—two or more of which may be executing concurrently, time-slicing the CPU's raw computing power between them.

It clearly isn't greed and power-lust that leads us to demand ever more powerful PCs. In a real sense, that demand is a result of the staggering complexity of the software that we use.

by Jim Seymour

► **IN THIS REVIEW**

Benchmark Tests	136	Hyundai 466D2	198
Summary of Features.....	156	IBM PS/2 Model 77 486DX2.....	198
AcerPower 486e DX2/66 Model 5657.....	125	IDS 466i2.....	200
ALR Flyer 32DT 4DX2/66.....	125	Insight 486DX2-66i.....	199
American Mitac TL4466.....	148	International Instrumentation	
American Super Computer		Blue Max Monolith 486D2/66UP.....	200
486X2/e66.....	148	Keydata 486DX2-66 KeyStation.....	201
Arche Legacy 486/66DX2.....	150	Lightning ThunderBox.....	202
Ares 486-66DX2 VL-Bus	155	LodeStar 486-DX2/66 EISA	
Ariel 486DX2-66VLB.....	155	WINstation.....	201
AST Bravo 4/66d.....	161	Mega Impact 486DX2/66E+.....	202
ATronics ATI-486-66.....	165	Memorex Telex 8092-66.....	204
Austin 466DX2 WinStation.....	171	ME 486-Local Bus/DX2/66.....	206
Bi-Link Desktop i486DX2/66.....	173	Naga Windows Workstation.....	206
BLK 486DX2/66	175	National Microsystems Flash	
Blue Star 466D2U.....	175	486DX2-66E.....	208
BOSS 466d.....	178	NCR System 3350.....	208
Broadax 486DX2-66.....	178	NEC Express DX2/66e.....	209
C ² Saber 486/e DX2-66.....	179	NETis Ultra WinStation N466L.....	210
CAF Gold 6D2.....	179	Northgate SlimLine ZXP.....	210
Clover 486 Quick-I Series.....	180	Occidental 66MHz 486DX2.....	211
Comex 486DX2/66.....	181	Osicom i466 MOD 420.....	211
Compaq Deskpro 66M	181	PC Brand Leader Cache 486/DX2-66.....	212
CompuAdd 466E	182	PC Pros 486/66DX2 5550T.....	221
CompuAdd Express 466DX2 Scalable	182	PCS Double Pro-66	221
Comtrade 486 EISA Dream Machine.....	183	Poly 486-66LM.....	222
Dell 466DE/2.....	184	QSI Klonimus 486DX2/66	222
DFI 486-66DX2.....	184	Qtech 486 4D2/66.....	223
Diamond DX2-66.....	189	Silicon Pylon II 486DXi-212.....	230
Digital DECpc 466d2 LP.....	189	SST 486DX2-66MWC	230
Edge 466 Magnum.....	190	Standard Windows Workstation Plus.....	231
EPS ISA 486 DX2/66.....	191	Swan 486DX2-66DB	232
Everex Tempo M Series 486 DX2/66.....	191	Tangent Model 466ex.....	232
Expo 486 dX2/66	192	Tri-Star 66/DX2-VL.....	234
FCS 486-66.....	192	Twinhead Superset 600/462C	234
FutureTech System 462E.....	193	USA Flex 486DX2/66.....	236
Gateway 2000 4DX2-66V.....	193	U.S. Micro Jet 486DX2-66.....	245
GCH EasyData 486DX-2/66.....	194	Wyse Decision 486si.....	245
Gecco 466E.....	197	ZDS Z-Station 486Xh Model 200.....	246
HP Vectra 486/66U.....	197	Zeos 486DX2-66.....	246

Several months ago (*PC Magazine*, June 16, 1992) we were raving about 50-MHz 486DX systems. A couple of months later (*PC Magazine*, September 15, 1992) it was 50-MHz DX2s. Now we're jumping up and down about 66-MHz DX2s, the latest "hot boxes" in an industry apparently devoted to accelerated obsolescence.

Every round of Intel's x86 processor upgrades has produced a new generation of faster-than-ever, better-than-ever PCs.

And yes, machines built around the 66-MHz 486DX2 are the current title holders. But unlike other recent latest-and-greatest entries, the 74 systems that are reviewed here may hold onto their championship crowns for a little while longer.

And even as they are supplanted by machines with even faster processors, their ease of upgradability should keep you running with the leaders for some time to come. Consider also that the first full-blown implementations of one of the

most important new PC video technologies of the 1990s appears in many of these machines, pushing them even farther ahead of the pack.

Finally, as the first generation of new PCs to come to market after last summer's restructuring of prices in the PC industry, these DX2/66s show that the major PC hardware vendors understand that the rules of the game have changed forever: Most of these computers are good values, and some are amazing bargains.

So no matter how blasé you may be about these claims of *latest* and *greatest*—we know, you've heard it all before—stay tuned: These are fast, classy machines at excellent prices. And they're likely to hold their value for a long time to come.

REVIEW CRITERIA

We sought review units on all shipping 66-MHz 486DX2s that fill the bill of a Windows workstation. The standard configuration we sought from vendors included 8MB of RAM, a 300MB hard disk (200MB was acceptable), and a 15-inch monitor (although we accepted 14-inch displays). In the end, we received 78 machines. A total of 74 made it through our tests; see the list on this page for a compilation (with page numbers for the reviews). We had several dropouts because of marketing changes: The system from Packard Bell was removed from the market, and PCI Systems was merged into Destiny Computers. In addition, two machines were dropped for technical reasons: i Corp's machine had a nonstandard clock crystal, and the Compudyne Products system contained a preproduction BIOS. As is often the case when we test the newest or fastest systems around, we had many companies that could not supply a system that was customer-ready, including Dataworld, Eltech Research, Micro Generation, and Packard Bell.

What we did get clearly indicates the direction in which power PCs are headed:

- Hard disks larger than 200MB and often upwards of even 500MB are now becoming the norm.
- Motherboards continue to get smaller and cleaner, with more efficient layouts and far fewer jumper wires covering mistakes caught at the last minute.
- Power supplies that push 300 watts in anticipation of power-hungry add-ins in provided drive bays and a multitude of

Our Contributors: BRIAN NADEL is an associate editor of *PC Magazine*. OLIVER RIST is a staff writer at *PC Magazine*. BRAD GRIMES is an editorial researcher at *PC Magazine*. BRUCE BROWN is a contributing editor to *PC Magazine*. JIM SEYMOUR is a contributing editor to *PC Magazine*. ROBERT ANTHONY, HENRY FERSKO-WEISS, and JOHN R. QUAIN are frequent contributors to *PC Magazine*.

expansion slots are becoming popular.

In sum, these 66-MHz DX2s represent some of the most advanced thinking, systems design, integration, and construction we've seen yet.

PERFORMANCE GOTCHAS

When you buy a power PC, you want power. So it's important to watch out for little "gotchas" that are sometimes scattered along the path to power by manufacturers that focused on the fine points of system design—or have simply cut corners too closely—to bring down the price of their systems.

In 66-MHz DX2 systems, a prime example of a nasty gotcha is the absence of a secondary processor cache. All Intel DX2 CPUs include a built-in 8K primary cache, which helps speed execution of programs by holding at the ready information that would otherwise require a much slower trip to the PC's system memory. That 8K cache has about a 92 percent "hit rate," or success rate, in lining up the data that will be needed next.

In other words, 8 percent of the time, the CPU still has to wait while the computer finds data somewhere in its standard dynamic RAM memory or on the hard disk. Even a relatively low 8 percent rate for trips to main memory slows these sprinters to a crawl. "Off-chip" memory reads can bring 66-MHz DX2 processors to their knees, waiting for data.

Intel knows that 8K of primary cache is just not enough for full utilization of the 66-MHz DX2's potential. Intel design engineers tell attendees at the company's DX2 motherboard-design seminars to plan on adding a secondary, external cache of at least 128K. Of course, 256K works even better.

The impact of a sufficiently large secondary cache showed up in our processor testing. The difference can be dramatic: 18 of the 20 top-performing machines had 256K or larger write-back second-level caches. But not all computer makers have learned this lesson: systems from IBM, Northgate Computer Systems, Occidental Systems, and Zenith Data Systems had no extended cache—and showed up in the cellar in processor testing.

VIDEO GOES LOCAL

One of the most important new techniques in improving the speed of PCs is

HIGHLIGHTS

486DX2/66 PCs

SPEED is of the essence with this group of DX2/66-based PCs. Processor scores were between 10 percent and 20 percent higher than a group of DX/50 systems that we tested several months ago. The current speed record holder is the Compaq Deskpro 66M; the BOSS, Comtrade, Expo Tech, Gecco, and Tangent systems are close on its tail.

FAST PROCESSOR and memory subsystems are very important for those individuals who compute in graphical user interfaces like Microsoft Windows or OS/2. The NCR 3350 ranked at the top of the list in memory and near to it in processor testing, making it a good system for supporting the most demanding of PC operating environments.

LOCAL-BUS VIDEO scored big in this test as a more efficient video subsystem. Particularly in Windows testing, these systems excelled. The stand-out was the Zeos 486DX2-66 system that blew all competitors away—in some cases performing more than ten times as fast as competitors.

WATCH OUT for proprietary, non-VESA local-bus systems because they will likely be superseded sometime soon by standard systems.

RECENT PRICE DECREASES mean that many of those DX2/66 systems we tested were high-performance machines at bargain basement prices; many more represented good value. Systems with these high-flying processors can be had for less than \$2,000; most were less than \$3,500.

LOOK FOR SYSTEMS with large external processor caches. While Intel's 486DX2/66 CPU contains 8K of on-board cache, it's not enough for a smoothly operating PC. Caching helps increase efficiency by providing a waiting place for frequently used data.

We believe this type of system should have 256K of second-level cache to perform at its fullest. The laggards in performance testing—IBM, Northgate, Occidental, and ZDS—all lacked an external processor cache.

POWER comes at a cost: heat build-up. These high-performance processor chips are often hot to the touch, and they require at least a heat sink to dissipate the heat. Better yet, we were especially impressed with those systems that included small CPU fans that fit right on top of the processor.

THINK AHEAD. Upgradability is still a major issue even with systems built around Intel's fastest chip of the day. A system that contains the 238-pin socket that will accommodate Intel's future generations of processors is an advantage that you are likely to appreciate only in years to come.

A SCSI-2 interface is an advantage that you may not need now, but which could come in handy in the future. It allows a system to expand with a multimedia CD-ROM, larger disks, and other peripherals, such as recordable optical media. Many of the systems we reviewed contain the interface at no additional cost; with other systems, SCSI is available as an added option at the time of purchase. In either case, its expansion capabilities might be a serious consideration in your search for a new system.

HARD DISK CACHING helped enormously on our DOS disk tests, but could actually decrease efficiency with Windows due to the improper use of SmartDrive.

GOOD VIDEO under DOS and Windows are no longer incompatible goals. The Micronics VL Bus motherboard, which was included on five of our systems, provides a good compromise between the demands of the two systems.



EDITORS' CHOICE

- **Edge 466 Magnum**
- **Gateway 2000 4DX2-66V**

If speed is of the essence, look no further than today's fastest PC chip available, Intel's 66-MHz 486DX2 CPU. This cutting-edge piece of technology has accelerated the pace of desktop computing and is likely to satisfy all but the most craven power users.

In this review of Microsoft Windows workstations we found an embarrassment of riches, making the selection of Editors' Choices extremely difficult. However, after closely examining these 74 PCs and running them through our battery of tests, we came across five that stood out in terms of value, performance and expandability, making them worthy of being singled out.

The two Editors' Choices for this round-up of DX2/66 PCs are the Edge 466 Magnum and the Gateway 2000 4DX2-66V. Both blend high-performance with good value, and allow the Intel processor to live up to its reputation as the current record holder for personal computing speed; the Gateway system was a finalist in our recent Technical Excellence Awards.

We also give Honorable Mentions to three other systems which, while delivering more performance for the price than the others in this group of power PCs, fell short in one area or another. The DX2/66 member of the Compaq Deskpro M family (two-time Editors' Choice recipients and a recent Technical Excellence award winner) remains an unassailable choice, but with what we consider a high price tag. The Tangent Model 466ex was one of the best overall performers of the group, but also at a price that's hard to take. By contrast, Zeos' 486DX2-66 comes with an attractive price tag and stunning video performance, but disappointed in other areas.

THE POWER EDGE

The greatest virtue of the Edge Technology 466 Magnum system was its all-around performance, taking top honors in two of seven benchmark tests and

dipping below average in none. It led this pack of computing overachievers in DOS disk and overall DOSmark scores, and aided by 256K of external processor cache, it was within a hair's whisker of the top in terms of processor and memory benchmark tests. In addition, with a Windows video score of over 10 megapixels per second, Edge's Magnum system was in the top quarter with a result that would have been at or near the top in any previous review. With a \$3,499 price, we felt that this machine offered a good combination of price and performance.

At \$2,995, the Gateway system presents the buyer with a unique bargain: the latest in PC technology at a nearly unbeatable price. Given all that it contains and its level of performance, it is a PC that should cost more, but we're glad it doesn't. Key to the Gateway's performance is its Micronics VL motherboard, which sports two VESA-compliant local-bus slots. The Gateway takes advantage of one for local-bus video, leaving the second slot open for future expansion. Along with the ATI video chip set, the Gateway ends the notion that a computer can not do well in both DOS and Windows graphics.

Four other machines in this test utilized the same base motherboard and local-bus system: the Ariel 486DX2-66VLB, the Tri-Star 66/DX2-VL, the Austin 466DX2 Winstation, and the Lightning ThunderBox. However, they did so with differing levels of equipment, price, and support. Gateway, which continues to rank high on our annual service and reliability surveys, puts it all together.

HONORABLE MENTION

A short rung below our winners are three systems that deserve recognition as clearly superior. The biggest news among them is the Zeos 486DX2-66's video system, which, at a Graphics Winmark score of 42.6 megapixels per second, shattered our previous record—eclipsing the score of the Compaq QVision graphics adapter by nearly fourfold. With knock-out video, and priced at \$2,995, the Zeos system is one of the value leaders in this test group. However, the system fails to measure up in terms of DOS-based processor and memory performance. For a single-purpose Windows system, the Zeos 486DX2-66 is a solid choice.

The Compaq Deskpro 66M, priced at \$5,192, is a high-performance machine that resolves many of the conflicts between DOS and Windows operation, performing equally well in each environment. The problem is cost. In an industry of rapidly declining prices, the price of the Compaq is beginning to look like an anachronism. While it has unequalled ease of expandability and has the highest processor score we've seen, the Deskpro's performance was balanced by its disappointing showing in both disk tests.

The Tangent Model 466ex was the only machine in this test to score all fours on our Suitability to Task measures of DOS and Windows applications and expandability. Despite turning in a stellar all-around performance, and having a SCSI-2 interface and a 340MB hard disk, the Tangent's price tag is hard to justify in this age of downward-spiraling costs.

taking video off of the PC's standard expansion bus (which usually runs at just 8 MHz, no matter how fast the CPU runs) and giving it its own, separate (or "local") high-speed bus, which can run at the speed of the processor. Local-bus video implementations began to appear in new PCs several months ago, but our tests then showed that those early efforts produced only very small improvements in video speed. Now, in this new generation of 66-MHz DX2 PCs, local-bus video subsystems are starting to make a big difference in speed.

The VESA (Video Electronics Standards Association) VL-Bus standard for local-bus video has been a long time in coming, so many PC manufacturers went off on their own and designed proprietary local-bus video slots. There is nothing wrong with proprietary designs—as demonstrated by the Hyundai Electronics America system and others in this test, which had exceptional video performance—but they may mean you'll have to rely on your PC vendor for video-driver upgrades in the future. If, as is likely, the vendor soon moves to VESA's emerging industry-standard VLB, you may unfortunately find that future support for its discontinued proprietary design is lacking.

Overall, the video performance of these machines is markedly better than we've seen before in our testing—espe-

cially in Windows graphics performance, where PC Magazine Labs' Graphics Winmark test routines provide an accurate basis for comparisons. The improvements are dramatic and come not a sec-

Recent Reviews: 66-MHz 486DX2 PCs	
Model	PC Magazine review (page)
December 8, 1992	
Clover 486-I Series	152
Compaq Deskpro M	158
Comtrade 486 Local Bus Win-Station	164
Dell 486 D Family	171
Diamond DT486XI	172
International Instrumentation	
Blue Max Monolith	184
Mega Impact	208
Micro Express ME 486-Local Bus	212
NCR System 3330	221
Standard Advantage EISA	242
Swan Direct Bus Line	243
Wyse Decision 486si	245

ond too soon for those of us who are growing old watching Windows repaint screens.

Our long-standing champion, Compaq's QVision, has consistently turned in Graphics Winmark scores of more than 12 megapixels per second on our Hardware Benchmark Tests, Release 7.0—and that was not merely respectable but outstanding in the past. This time, such figures were left in the dust by

screamers like the incredible Zeos 486DX2-66, which, with the help of its VL local-bus video design and Weitek's new Power 9000 chip, topped the list with a Graphics Winmark score of 42.64 megapixels per second.

By contrast, just a few months ago we were routinely seeing new PCs come to market with Graphics Winmark scores around 1 or 2 megapixels per second—and scores of 7 or 8 indicated very good performance indeed.

In this group of 66-MHz DX2s, the average Graphics Winmark score for all machines (excluding the Zeos score) was 8.09. Clearly, the combination of accelerated video board designs, such as the ATI Graphics Ultra Pro and both VL-Bus and proprietary local-bus video implementations, has raised the industry standard substantially (see the chart on the next page). For those who don't use Windows, there is other good news. For the past year we've been seeing PCs that had good Windows video performance but poor DOS results, or vice versa. Until now, few could provide a good compromise between the two computing environments. We found several machines with respectable DOS and Windows video scores, such as the AcerPower 486e.

The time it takes to redraw the screen of a PC, especially in graphical environments, powerfully shapes our perception of the speed of a computer. Thus, fast

Suitability to Task: 486DX2/66 PCs

Of the 74 DX2/66 systems we looked at, only one—the Tangent Model 466ex—combined excellent expandability with the ability to run DOS and Windows applications efficiently.

The rating for **DOS applications** describes the system's ability to run DOS software quickly and efficiently. To earn an **excellent** rating in this category, a system needs at least a 200MB hard disk and a DOSmark score that put it among the top quarter of the systems we reviewed. Because this area is so dependent on microprocessor design—and all of the PCs we reviewed used powerful 486DX2/66 processors—many systems were rated **excellent**, and none of them were ranked lower than **good**.

Windows applications is a more demanding category; the rating indicates how well a PC will operate

Windows software. Performance factors include a unit's Graphics and Disk Winmark scores as well as its DOSmark score. Hardware factors include the maximum RAM supported on the motherboard, hard disk options, the maximum noninterlaced resolution supported by the graphics adapter and monitor, the screen size, and the presence of a mouse port. All of the machines we reviewed were judged at least **fair**. Well-designed DX2/66 systems containing top-flight (typically local-bus) video controllers and fast disk subsystems received **excellent** ratings. These systems are unlikely to disappoint even the most demanding Windows users.

The **expandability** rating indicates a system's potential for growth. The ease of upgrading the processor, external processor cache, and system BIOS is taken into consideration. Other features factored into this rating include hard disk options, maximum RAM installable on the motherboard, available drive bays and bus slots, and 16550 Universal Asynchro-

SUITABILITY TO TASK				
Product Name				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	○	○	○
Windows applications	●	●	○	○
Expandability	●	●	●	○
Expandability	●	●	●	●

nous Receiver/Transmitter (UART) support for asynchronous communications. Systems judged **excellent** had drive bays and bus slots (including local-bus slots) to spare, flash BIOS, and easily upgradable processor/cache subsystems. In general, we have found that the manufacturers of these high-end systems have been attentive to users' desires to eventually expand and improve their machines. Some of these systems may even be capable of supporting the next generation of microprocessors.



The drive and determination to advance can be seen in many forms. Here's a couple we think you'll be excited about.



Introducing the Microsoft database management systems.

Some people aspire to become famous athletes. Others to become great scholars. But for a group of us here at Microsoft, there's nothing more important than creating a new line of databases with the tools and technology you need to do your everyday tasks.

For example, some of you will need dBASE® compatibility and unequaled performance. That's why we have Microsoft® FoxPro® 2.5. Some of you need seamless access to data in multiple formats. For you we have the Microsoft Access™ database for Windows.™

But all the tools in the world won't do you much good if you can't get help when you need it. So we have a world-class product support organization to quickly answer all of your database questions.

In addition, we've created a special program for developers that will put you directly in touch with some of our senior product support people.

In the future, our technology will con-

tinue to evolve with you in mind. So what you create today will still work tomorrow. In short, there will be no dead ends.

We're also committed to supporting open standards and compatibility. Currently, we are working with ANSI to develop a standard Xbase language.

Plus we fully support the Open Database Connectivity (ODBC) technology, which will allow you to access files from even more of today's database management systems.

And to ensure there will always be a vast supply of industry-specific products and services to meet your database needs, we're forming strong business partnerships with many other companies.

So if you'd like additional information on Microsoft's database solutions, give us a call at (800) 882-2000, Dept. JF9. And find out just how motivated we are to become your database company.

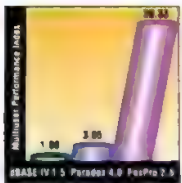


Both Microsoft FoxPro 2.5 and Microsoft Access were created to take complete advantage of the Windows operating system.

Microsoft
Making it easier



Since the beginning of time, people have been obsessed with reaching ever increasing rates of speed. So what else is new with Microsoft FoxPro 2.5?



Microsoft FoxPro version 2.5 is the fastest PC database management system available today.

Plenty. For starters, the new Microsoft® FoxPro® 2.5 for Windows™ has a rich and productive environment with an intuitive graphical interface. Which means it's never been easier for you to use and develop powerful Xbase applications.

Plus there's a virtual hardware store of tools for both developers and users.

For developers, there are professional tools designed to help you create the most powerful applications possible.

Like the Trace and Debug windows, Project Manager, Menu Builder, Screen Builder and Report Writer.

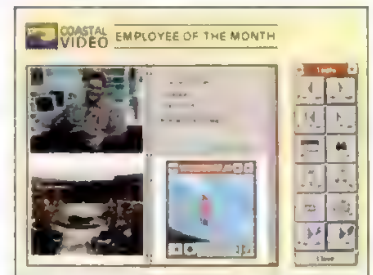
For users, there are handy tools that make it easy to do complex database tasks without programming. Like Relational Query By Example (RQBE), which allows you to build and see queries instantly. Or the graphical Browse tool, an intuitive way to view data. And finally, Quick Screen and Quick Report, two easy ways to create objects and see data.

And now with the arrival of FoxPro 2.5

for both the Windows and MS-DOS® operating systems (and soon for the Macintosh® and UNIX®), you can have the most powerful and most graphical Xbase applications across all major PC platforms. And if you are thinking about migrating to Windows in the future, have no fear. Because Microsoft FoxPro for Windows will easily run all your FoxPro 2.0 files.

But no matter which platform you choose, you can count on Microsoft FoxPro to provide you with the fastest PC-based database management system.

For additional information, just zip on over to your nearest reseller, or call us at (800) 882-2000, Dept. JG2. We'll be more than happy to tell you all the ways Microsoft FoxPro 2.5 for Windows can get your adrenaline pumping.



FoxPro 2.5 takes advantage of Windows and allows you to create dazzling applications.

Microsoft®
Making it easier



People always seek the most direct route to achieve their goals. So you've probably been looking for a database like Microsoft Access.



With AccessWizards, you have a guide to walk you through complex tasks, one step at a time.

If you're a database user or programmer, we'd like to show you a great shortcut. It's called Microsoft Access™. It's a new database management system for Windows™ that can give you something no other

database can. Easy access to the powerful features you need to do your job.

To start with, Access takes complete advantage of the Microsoft® Windows operating system. Which means it has never been easier to create great-looking forms and reports. Plus you can store objects like pictures, graphs, sound, and video. Right in your database files.

And if you ever get stuck, there are ReportWizards, FormWizards and ChartWizards to come to your rescue. They'll ask you questions about format, content and style. Then they'll automatically create your report, form or chart.

There are also Cue Cards to walk you through the most difficult database tasks. Guiding you one step at a time.

In addition, it's easy to create complex

queries by using the graphical Query By Example. You just drag and drop tables, join fields, and plug in all of the specifics.

And you developers can write sophisticated database applications with Access Basic. A powerful, extensible programming language.

What's more, Microsoft Access can easily read and write all the major database formats directly, including dBASE®,

Paradox® and Microsoft SQL Server. So you and your coworkers can still use all your old files, no matter what format they are in. That means, your investment is safe and everyone can easily migrate to Microsoft Access at their own pace.

To receive additional information on Microsoft Access, call (800) 882-2000, Dept. JG3. We'll give it to you straight.



Create complex queries visually with our graphical Query By Example.

Microsoft
Making it easier

video performance not only makes PCs run faster, it makes them seem faster still. We've rarely seen that demonstrated so well as with these 66-MHz DX2s. While their average CPU performance is only about 15 percent to 20 percent ahead of the 50-MHz 486DXs that were our previous speed champs—a margin of improvement that does not stir much interest in most PC users—the fast video subsystems of these machines often make them seem far faster.

DISK BENCHMARK RESULTS

We also saw in these PCs a new emphasis on high-speed disk performance. Only a part of that comes from raw hard disk speed itself—though manufacturers' moves toward such exceptional products as the 520MB Fujitsu hard disk, with its 12-millisecond average access time, are a welcome trend. The larger part of the improvement we saw came from caching disk controllers. By including big chunks of memory on-board the disk controller card, PC manufacturers can deliver the kind of hard disk access times most PC users have only dreamt of seeing in their machines. The Edge Technology machine was the champ here. Its Mylex EISA SCSI disk controller, stuffed with 8MB of RAM, raced through DOS and Windows disk tests alike. Its disk speed, 208.55K per second, was more than four times as fast as the 47.86K-per-second average of these 66-MHz DX2s.

The importance of caching controllers is well understood. Among these machines, all 15 of the top performers in disk speed used caching controllers; 13 of the 15 had 2MB or more of cache memory.

Not long ago, such performance would have been striking yet largely unneeded. But in machines based on a processor that crunches data internally at 66 MHz and deals with the outside world at 33 MHz, it is critically important to keep the pipeline of data full and flowing into the processor. Otherwise, you throw away a substantial part of the power by insisting that the CPU wait for the data it needs. Fast-caching disk controllers cut out that potential bottleneck and are a key to good performance in fast PCs.

Unfortunately, getting the most out of a caching controller isn't just a matter of plugging in the machine and going to work. We found striking differences

among similar implementations in our test results when we looked at the performance of many of the fastest DX2s tested. The key variable was the Windows disk-caching utility SmartDrive. Windows defaults to a 2MB SmartDrive cache in systems with 8MB of RAM, so those are the settings we used for these PCs on our Disk Winmark test routines (for our DOS disk test routines, we do not use SmartDrive).

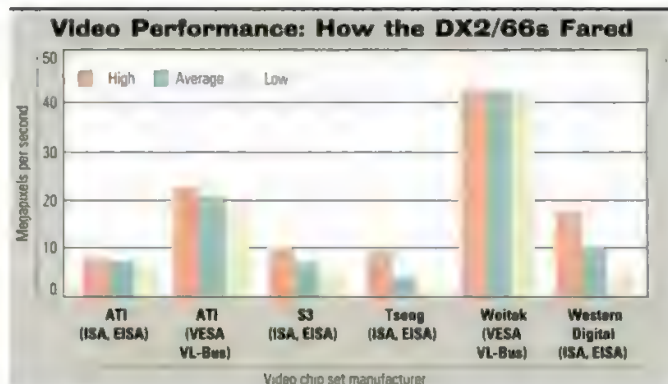
We were surprised to see that on some machines with hardware caches, performance actually slowed when Smart-

ods to help these chips keep their cool: Some vendors use heat-sinks; some use tiny, chip-top fans, and some do nothing. Intel acknowledges that the heat from 486s of every sort must be dissipated—or damage to the motherboard, to surrounding components, and to the chip itself is possible.

Look for unexpected but useful built-in features, too. For example, some vendors use high-speed SCSI-2 controllers for the hard disks installed in their 66-MHz DX2s. That not only enhances hard disk performance but also gives you a

built-in SCSI controller that can be used to daisy-chain up to six more components via internal or external connections.

The most popular SCSI add-on devices are now CD-ROM drives, but digital audio tape (DAT) drives for making quick and reliable backups are becoming



The benefits of freeing the video subsystem from the peripheral bus are apparent when you look at the Graphics Winmark performance results.

Drive was in place. As we analyzed the test results and retested several machines in a variety of configurations, it became evident that when both SmartDrive and the caching routines on a cached disk controller are filling their data buckets and reading ahead for the next chunk of information they think we'll need, the PC can actually be slowed by their interaction. The penalty is sometimes severe: We measured throughput sags of 8 percent to 45 percent, with most machines falling between 10 and 20 percent. If you buy a 66-MHz DX2 with a caching controller, plan on spending a little time fine-tuning the operation of SmartDrive.

FRINGE BENEFITS

Some important factors in these DX2/66 designs do not show up on the spec sheets: for one, the treatment of the 5 watts of power consumed and the heat thrown off by the DX2/66 chip, which is more than 15 percent higher than that of a DX/50 chip. Intel specifies a maximum surface temperature of 210 degrees Fahrenheit, and many were hot to the touch. Vendors choose a variety of meth-

popular, as are desktop scanners and optical drives. You may need to purchase a package of software drivers for additional SCSI devices, and getting any SCSI component to work properly sometimes takes a little fiddling and experimentation. But getting that SCSI controller built-in—and already working with your system's default BIOS, DMA, and interrupt settings—at no cost is a real benefit and a bargain.

Consider, too, the capacity of the hard disk in a machine you're thinking about buying. One rule of thumb: No one ever bought a hard disk with too much capacity. As Windows applications that take 8MB to 10MB of disk space each continue to proliferate, and as we move into the era of operating systems (such as Windows NT and OS/2 2.x) that gobble up disk space by the tens of megabytes, you may want to look at the cost of upgrading the machine you select to a 300MB, 500MB, or even larger disk at the time of purchase.

Some vendors make that easy and remarkably affordable: Ares's 486-66DX2 normally comes with a 240MB Quantum



A basic idea of how our new PC will accelerate Windows.

Now you can race through Windows™ up to ten times faster.

Introducing the Epson® Progression®, the first PC with Wingine™

graphics acceleration. Developed by CHIPS™ and Technologies, this Wingine chip is less costly and complicated than typical accelerator cards, and provides more standard color capabilities

than you'll find in most other personal computers.

The improvement in performance is so dramatic, you've got to see the Epson Progression to believe it. So we've created a video to let you do just that. For your free copy, call 1-800-BUY-EPSON. But hurry. They're going very, very fast.



EPSON®



Desktops



Dot Matrix



Notebooks



Lasers



Servers

Freed and Derfler Bridge the Communications Gap.



ISBN: 1-56276-037-8
Price \$29.95

If all the technological advances and new products have you wondering what's really worth your time and money, bridge your communications gap with *PC Magazine Guide to Modem Communications*. Whatever your budget, whatever your technical know-how, whatever your present equipment—Les Freed and Frank J. Derfler, Jr., have the answers. They've worked with and tested just about every known hardware option, software product, and on-line service.

Available
at fine
bookstores,
or call

1-800-688-0448
ext. 1214



© 1992 Ziff-Davis Press

drive, for example, but can be upgraded when you buy it to include either a 425MB Quantum IDE drive for \$550 or a Maxtor 1.2GB SCSI drive for \$1,300. Ariel makes the decision even easier: Its 486DX2-66VLB uses the Fujitsu 520MB drive, but a 1GB Maxtor disk is available for just \$400 more.

UPGRADABILITY

We said earlier that this new generation of desktop computers is very likely to stay on your desk for a longer period of time than many of its predecessors did. That is because of the substantial upgrade headroom built into most of these machines. Originally, these DX2 chips began life themselves, of course, as an upgrade scheme—as a way to wring more performance out of existing 486 PCs. By running twice as fast internally as externally—a process known as “clock-doubling” or, a little more precisely, as “speed-doubling”—they can deliver higher performance but can also work with existing memory, bus speeds, and add-in cards. This has helped system designers get DX2 designs to market faster, too, since many existing components and design techniques can be used.

DX2-based PCs extend that same upgradability to their buyers through either of two paths. An Intel OverDrive socket next to the CPU socket on the motherboard of almost any one of these machines allows easy, plug-in upgrading to future CPUs. Look for machines with ZIF (zero-insertion-force) upgrade sockets, which make the process far quicker and less perilous.

The question won't be whether you will want to upgrade but which new and faster chips Intel will find profitable to produce. Publicly, the company isn't talking about the possibility of faster DX2s, such as a DX2/100 design. Privately, Intel insiders suggest that while they know perfectly well how to build faster DX2s, it may not be a smart business move for them. Instead, they say, buyers of 66-MHz DX2s can look forward to what some call “the BIG upgrade”—Intel's Pentium chip (originally called the P5 and the 586), perhaps as soon as sometime later this year. It is difficult to separate fact from fiction in the advance publicity on the Pentium, but some microprocessor experts say this new

superchip will offer a substantial improvement in raw processing speed. The Pentium is expected to start at 66 MHz and come in a variety of speeds.

If you are interested in taking your 66-MHz DX2 into Pentium country someday, make certain that the machine you buy has the 238-pin expansion socket required for the first-generation Pentium processor. Be sure to consider also the financial health and probable longevity of the computer vendor you choose, because you may need BIOS upgrades as well if and when you move up to the Pentium. Owners of early 486SX machines who expected to upgrade with the aftermarket, user-installable DX2s (called OverDrive chips by Intel) have sometimes been disappointed to learn that their financially strapped PC suppliers do not intend to offer the new BIOS required to import the new chips.

BEYOND THE HORIZON

As well-positioned as these 66-MHz DX2 speedsters are for future upgradability, you should know about two other choices that are likely to be tempting—but probably unavailable to buyers of these machines. A 66-MHz 486DX chip may be available soon, and if it appears, machines using it will have a performance edge over DX2s (though probably a small one). The big benefit of these new chips would be as the processing core for network servers that are memory-intensive. They will be more costly, of course, and frankly, at this level, the dazzling performance of the best of these 66-MHz DX2s may make incremental improvements meaningless for most PC users.

More tantalizing, though, are the new clock-tripled 486s coming from IBM. Announced at last Fall's Comdex, the first of these chips will run externally at a nice, comfortable 25-MHz pace, for wide compatibility—but will run at 75 MHz internally, delivering about 30 percent more processing firepower than 66-MHz DX2s. The next step will be a clock-tripled 33-MHz chip whose core processor will run at 99 MHz. Still more tantalizing is the inclusion of a 16K of internal cache, which should go a long way toward reducing processor bottlenecks. Neither IBM nor any other vendor has yet delivered a machine using the chips. We should see the first production PCs using speed-

COMPUTERS

486DX2/66s

tripled IBM 486s by mid-year. Don't plan on plugging one into your 66-MHz DX2.

It is important to note that these IBM-produced 486 chips are licensed offshoots from Intel's mainstream CPUs. IBM has so-called "mask rights" from Intel to produce real 486s, and to make any design and performance improvements as it sees fit along the way. Many people had thought that IBM would manufacture these chips only for its internal use and not become a merchant chip maker selling to others. But the prospect of an IBM 486SLC "speed-tripled" processor seems likely to break that pattern, as an increasingly opportunistic IBM looks for new sources of revenue.

If your growing need for speed means that you've been closely reading the specs and eyeing the ads for new computers lately, then you will probably find the answer to your needs in the pages that follow. These new 66-MHz 486 DX2s are not universal PCs: At around \$3,500 for a typical machine in a ready-to-run configuration, for example, they're not likely to be chosen as entry-level systems. But for those users who require power and speed, these computers represent a combination of design, performance, and upgradability—let's call it value—that marks a new high-water point for the PC industry.

Acer America Corp.

AcerPower 486e DX2/66 Model 5657

The AcerPower 486e DX2/66 Model 5657 from Acer America Corp. carries a pleasantly low \$3,599 price tag, while offering competitive performance augmented by an EISA bus, local-bus video, and even a SCSI-2 connection.

Overall, the AcerPower system is solidly built, but its mostly plastic case still bends at certain points. Acer managed to squeeze in six drive bays by placing the two internal 3.5-inch bays above the power supply. The 213MB Conner hard disk is located in the upper internal bay, leaving only about an inch of clearance between the hard disk and the power supply.

Acer's motherboard has five EISA slots and two 16-bit ISAs. The CPU sits in an oversized 240-pin socket; nearby is

an upgradable processor cache module. I/O ports, including a built-in SCSI-2 connection, are wired out of a special 16-bit Super I/O E4+ card. The card comes with a hefty manual that details its ability to handle all I/O and drive-controller functions, as well as SCSI-2. The EISA Local Bus PowerVision graphics adapter can hold 2MB of VRAM; it comes with an ATI 68800 video controller, a local-bus extender, and a high-color RAMDAC.

The processor score ranked above the



average, although the memory score fell below. Video was predictably good under both platforms but especially high under Microsoft Windows. The disk score was

FACT FILE

AcerPower 486e DX2/66 Model 5657

Acer America Corp., 2641 Orchard Pkwy.,
San Jose, CA 95134; 800-733-2237,
408-432-6200; fax, 408-433-3622

List price (tested configuration): \$3,599

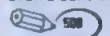
Memory and processor RAM cache: 8MB 80-ns
SIMMs, 256K external SRAM cache

Disk drives and controller: 213MB Conner CP30204
IDE hard disk, integrated Adaptec controller, 1 2MB and
1.44MB floppy disk drives

Display: PowerVision Graphics Accelerator card with
ATI 68800 chip set and 1MB of video memory, 15-inch
AcerView 35 UVGA monitor, 60-Hz refresh rate at 1,024
by 768

Software: DOS 5.0, Microsoft Windows 3.1

In short: Acer America has managed to produce a credible product that effectively combines competitive EISA performance (especially its video scores), a nicely designed interior (including modular upgradability), and even a built-in SCSI-2 connection.



ON READER SERVICE CARD

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expendability	●	●	●	●

disappointingly low under DOS simulations in our benchmark testing but just a shade above average under Windows.

With a competitive price, solid performance, and a one-year warranty with a year of free on-site service, the AcerPower 486e DX2/66 Model 5657 remains a quality system that delivers on performance.—*Oliver Rist*

Advanced Logic Research Inc.

ALR Flyer 32DT 4DX2/66

Although Advanced Logic Research's \$3,962 ALR Flyer 32DT 4DX2/66 fills a slimline case with a high-power CPU and some degree of upgradability. The result may still leave you wanting a little bit more.

The slimline case is sturdy, but it is also all metal, requiring the use of a screwdriver to open it. This is not really a problem until you attempt to put the case back together, which can be a rather frustrating exercise.

ALR, which also makes a DX2/66 in its lower-cost LCT family, puts the design emphasis on modularity. The ALR Flyer 32 motherboard allows you to upgrade the processor, the external cache, the SCSI connection, a modem connection, and even its BIOS through Flash technology. The CPU contains only three ISA





Stacker works with portables and laptops, which is one of the few ways to increase their capacity.

Like a gas gauge for your computer, the Stackometer continuously monitors the amount of space you have left.



Stacker is so advanced, it even works in places where it doesn't exist. Because once your removable disk is stacked, you can read from or write to it anywhere, even on a PC that doesn't have Stacker.



For the perfect combination of compression and speed, use the Stacker Tuner.™

Normally, Stacker gives you a compression ratio of about 2:1. With the default setting, you can get maximum speed. But by simply tuning the settings, you can increase disk capacity by up to 10%. So on a 200 meg drive, that means an extra 40 megs of space.



Our data compression technology has a proven track record. In fact, over four million people use it every day. From Fortune 500 companies to home offices.



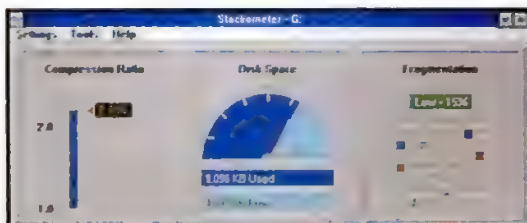
INTRODUCING STACKER 3.0 FOR WINDOWS™ AND DOS, AN EASY AND INEXPENSIVE WAY TO DOUBLE YOUR DISK CAPACITY. ▶ USING OUR PATENTED LZS TECHNOLOGY, STACKER "STACKS" STORED FILES TIGHTLY, CREATING MORE SPACE FOR ADDITIONAL FILES. ▶ AND EXPLAINING WHAT STACKER WORKS WITH IS EVEN SIMPLER. EVERYTHING. BECAUSE STACKER IS COMPATIBLE WITH ALL STANDARD DISK DRIVES, UTILITIES, APPLICATIONS, MEMORY MANAGERS AND CACHING PROGRAMS. ▶ SO IF YOU'D LIKE SOME EXTRA STORAGE ROOM, VISIT YOUR LOCAL DEALER OR CALL 1-800-522-STAC, EXT. 6060. AND FILL UP YOUR DISK. WITH A LOT OF EMPTY SPACE. STAC®



The only place where we might run out of room is on our trophy shelf. In less than two years, we've won every major award in the industry. Including PC Magazine's Editors' Choice and Windows Magazine's WIN 100.



On all stacked drives, you can set double passwords, one for read/write and one for read-only access. With read/write, users who don't know your password have no access to your data. With read-only, they can see the data but are unable to alter it.

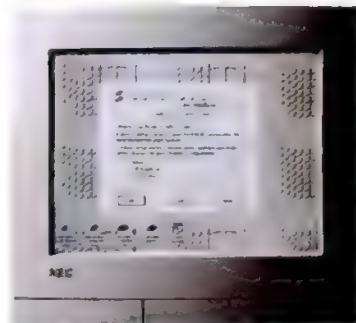


In addition to your available space, the Stackometer™ also shows you your compression ratios and fragmentation levels for all of your drives.



You can double your disk capacity on the full range of hard drives, all the way up to 2 gigs. As well as on floppy drives, Bernoulli™ disks, SyQuest™ cartridges, optical and floptical drives, and memory cards.

© 1992 STAC Electronics. STAC and Stacker are registered trademarks of STAC Electronics. All other product names are trademarks of their respective owners.



If you use our Express Setup, just insert the disk and press return a few times and you're done. With the Custom Setup, you can adjust Stacker to fit your exact needs.



In explaining what our new software does we ran out of space.

Fortunately, that's a problem we know how to solve.

CIRCLE 061 ON READER SERVICE CARD



■ What the Numbers Mean: DX2/66 PCs

PROCESSOR

A second-level processor cache dramatically improves processor performance in DX2/66 systems, with a write-back cache being the best choice. The systems with the top 20 processor scores all had write-back designs. The Compaq Deskpro 66M led the way, with a spectacular 17,326 processor operations per second, followed by the Comtrade, Tangent, and Expo Tech units. The Compaq and Expo Tech used proprietary four-way set-associative L2 cache designs, while the Comtrade and Tangent used direct-mapped SiS cache designs.

The underachiever was the ZDS Z-Station 486Xh Model 200, with 10,806 processor operations per second. Of the bottom ten systems, six had L2 caches of varying designs, five of them direct-mapped. We suspect that either their cache wait states and burst rates were not optimized or their internal cache logic was too slow.

On our processor test routines, these units had an average 486 L1 read hit rate of 92 percent. Unfortunately, even 8 percent off-chip reads can be very costly for DX2/66 systems with DRAM-only designs. In addition, wait states are often inserted into DRAM memory cycles, leaving the processor waiting for memory to respond.

VIDEO

Our experience has been excellent with the Tseng ET4000 video chip sets and disappointing with their S3 counterparts. The PC Pros 486/66DX2 5550T, with S3's new 86C801 chip, was only a tad faster than the older S3 designs. Local-bus accelerator boards with the ATI Mach 32 chip offered better video performance under both Windows and DOS.

Four systems using the Micronics VL-Bus motherboard—including those from Lightning, Ariel, Austin, and Gateway—included the ATI card and performed very well. The Tri-Star system came comparably equipped but failed to keep up with the others. Hyun-

dai has also used the new ATI card in its proprietary local-bus slot, and its unit came closest in performance to that of the Tseng-based systems.

The Micro Express unit hit the peak, at 10,206 thousand video operations per second, followed by the PCs from CompuAdd Express (9,955) and Wyse (9,770); both use the Tseng ET4000. Of the bottom 20 systems, 17 are S3-based.

DISK

The highest disk performance came from the EISA-based Edge Technology system—a whopping 208.55 kilobytes per second. Of the top 15 disk performers, 8 had EISA buses, 6 had ISA, and one—the IBM—used the Micro Channel.

Surprisingly, the NEC Technologies unit was abysmally slow, partly because its adapter did not have cache RAM. The next-worst system, from PC Brand, suffered from slow random reads, writes, and sequential operations.

DOSMARK

The DOSmark leader was the Edge 466 Magnum, followed by the Tangent unit. At the low end of the spectrum, the NEC system exhibited poor disk performance, which hurt its DOSmark score.

GRAPHICS WINMARK

The systems with the best Graphics Winmark scores benefited from graphics accelerators and/or local-bus video subsystems. With the new Weitek Power 9000 chip on the Zeos VGA 9000 (a VESA local-bus graphics adapter), the Zeos system achieved 42.64 megapixels per second—the highest score we've seen so far. The Weitek optimizes pattern BitBlt (PATBLT) operations, which are very common in Windows applications. The next-closest competitor—the Austin system, using the ATI Mach 32 chip—delivered an impressive 22.99 megapixels per second.

The C2 system, using the new Western Digital WD90C31-LR chip contained on the Diamond SpeedSTAR 24X, scored a strong 18.09, while the Acer system used the ATI Mach 32 chip in the local-bus Acer PowerVision card to attain a score of 18.02. Bottoming out were the Blackship, PC Brand, PCS, and Gecco systems. The Blackship and Gecco used ISA-based Orchid ProDesigner II cards with Tseng ET4000AX chips. Of the bottom 20 performers, 10 had Tseng-based video.

DISK WINMARK

Many of the systems with a hardware disk cache performed less efficiently with SmartDrive—with a reduction in throughput of anywhere from 8 to 45 percent, with most hovering around 10 to 20 percent. It's possible that efficiency is reduced when SmartDrive and a hardware cache are both performing lookups on the same data. The ATronics, Comtrade, DFI, and International Instrumentation systems—all IDE-based machines with hardware caches—performed well under DOS but were only average under Windows. Tangent's SCSI system had the same characteristics.

A Mylex DCE376 EISA SCSI bus-mastering adapter with 8MB of hardware cache was the major factor in the Edge system's first-place performance (141.57K per second). With a 2MB SmartDrive cache loaded and an 8MB caching IDE subsystem, the Micro Express unit captured second place (87.08), but SmartDrive definitely impeded its performance. Without SmartDrive, the Micro Express achieved a stunning 158.70, compared with the Edge unit's 157.92 without SmartDrive.

On the other end of the spectrum, the Tangent's SCSI disk subsystem (using a 4MB Tangent Disk Wizard caching controller) earned it a place among the top 15 for DOS disk performance, but it had the slowest Disk Winmark score.

Check It Out!

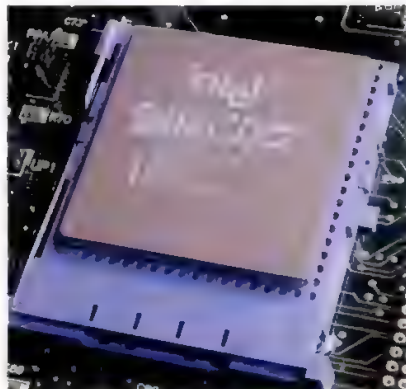
**ZEOS[®]
Announces
New Lower
Prices.**





ZEOS.[®] See The Difference.

FREE software. Now you get your choice of a popular Windows application from Lotus—plus DOS, Windows and the new Lotus Organizer. With all the free software you get with your ZEOS, you save hundreds of dollars!



No one else gives you so much upgradability in your computer.

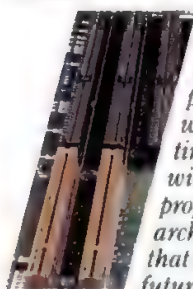
Notice the extra row of pins in the CPU socket? Now you can upgrade from any i486 all the way to the 1993 super OverDrive processor based on Intel's Pentium™ architecture. And the ZIF (Zero Insertion Force) socket makes it so easy!



On-board SCSI option.

As time goes on, you'll want to add more to your system. Our on-board SCSI circuitry with optional \$49 SCSI chip will allow you to easily add SCSI hard drives (running in addition to your standard IDE drives) plus tape backups, optical drives and a host of other SCSI peripherals. Only from ZEOS.

VESA-standard local bus!



Now you get blazing local bus performance without getting stuck with some proprietary architecture that has no future. ZEOS offers two local bus slots using the VESA standard—plus on-board local bus IDE. Few of our competitors are presently meeting this standard. And with our bus mastering capability, a second local bus card can be added in the future, too.



Award-winning support, around the clock.

We're always here for you, offering 24-Hour Toll-Free Technical Support, 365 days a year. Most of the others don't offer you this. If they don't support you, why support them?

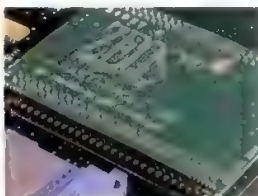


Same-day shipping on our most popular systems.

Want your computer now? We can do it! Order by 1PM Central Time and we'll ship your "Computers Now!" order today—guaranteed!

Your choice: 128K or 256K cache.

For the most memory-intensive applications, a secondary cache is highly recommended. ZEOS gives you your choice of high-speed cache options.



Eight expansion slots: Plenty of room to add to your system in the future.

Because we care about the long-term useability of your computer, there's room inside to expand. And with the way things change in this industry, it's a good idea to have a computer that can grow with you.



View The Options.

ZEOS Pkg. #1

- Your choice of CPU with upgrade options. Our Zero Insertion Force (ZIF) upgrade socket makes it easy.
- 2MB of high-speed RAM expandable to 64MB on the motherboard.
- 85MB high-speed IDE hard drive with built-in cache.
- 1.2MB or 1.44MB Teac® FDD.
- ZEOS 14" Hi-Res mono VGA monitor with 1MB high-speed VESA local bus card.
- Eight expansion slots including two VESA local bus slots.
- Two serial and one parallel port.
- Shadow RAM/EMS support.
- Optional SCSI port (plug-in chip) for SCSI I & II devices including hard drives, tape drives, optical disks and more.
- Upgradable high-speed cache options of 128K and 256K.
- Flash BIOS for easy BIOS upgrades via disk or modem.
- High-capacity power supply with built-in surge suppression.
- Rugged ZEOS SpaceSaver case with six drive bays and two cooling fans for added reliability.
- ZEOS RS/101 key tactile/click keyboard, double injection key caps with Alps keyswitches.
- Microsoft DOS Version 5.0.
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support, 30-Day Money-Back Guarantee, Customer Satisfaction Package.

Incredible ZEOS Pkg. #2

We take package #1 and add more memory, a bigger drive, both floppies plus a MS Mouse *and* free software!

- Your choice of upgradable CPU.
- 4MB of RAM expandable to 64MB on the motherboard.
- Our 130MB high-speed IDE hard drive with built-in cache.
- Both 1.2MB and 1.44MB Teac® floppy drives.



PACKAGES 2, 3 & 4 INCLUDE LOTUS SOFTWARE!

Pkg. #1	Pkg. #2	Pkg. #3	Pkg. #4
\$1395	\$1895	\$2195	\$2595
\$1495	\$1995	\$2295	\$2695
\$1595	\$2095	\$2395	\$2795
\$1695	\$2195	\$2495	\$2895
\$1795	\$2295	\$2595	\$2995

Add \$149 for 128K or \$298 for 256K cache.

- Super-fast VESA-standard Diamond Stealth 24VLB graphics adapter gives you 16.7 million colors!
- ZEOS 14" Hi-Res 1024 x 768 non-interlaced VGA color monitor.
- Your choice of Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics, plus Lotus Organizer, DOS, Windows, and a genuine MS Mouse.

ORDER NOW TOLL FREE

800-554-7172

Fax Orders:

612-633-1325

**Open 24 Hours a Day
365 Days a Year!**

Incredible ZEOS Pkg. #3

With Package #3 we add even more memory, a larger drive *and* even more savings.

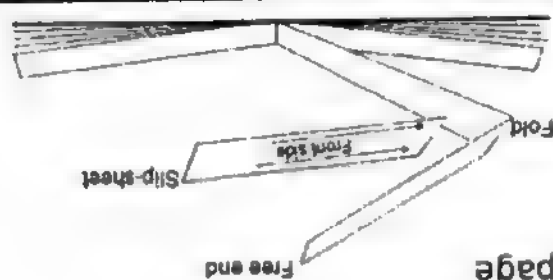
- Pick the CPU power you want.
- 8MB of RAM expandable to 64MB on the motherboard.
- A full 245MB high-speed local bus IDE hard drive with built-in 128K cache. 12ms seek time!
- Both 1.2 and 1.44 Teacs.
- Super-fast VESA-standard Diamond Stealth 24VLB graphics adapter gives you 16.7 million colors!
- ZEOS 14" Hi-Res 1024 x 768 non-interlaced VGA color monitor.
- Your choice of Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics, plus Lotus Organizer, DOS, Windows, and a genuine MS Mouse.

The Ultimate! ZEOS Pkg. #4

Memory goes to 16MB, your drive up to 340 Megabytes. Nobody can touch it. This baby's hot!

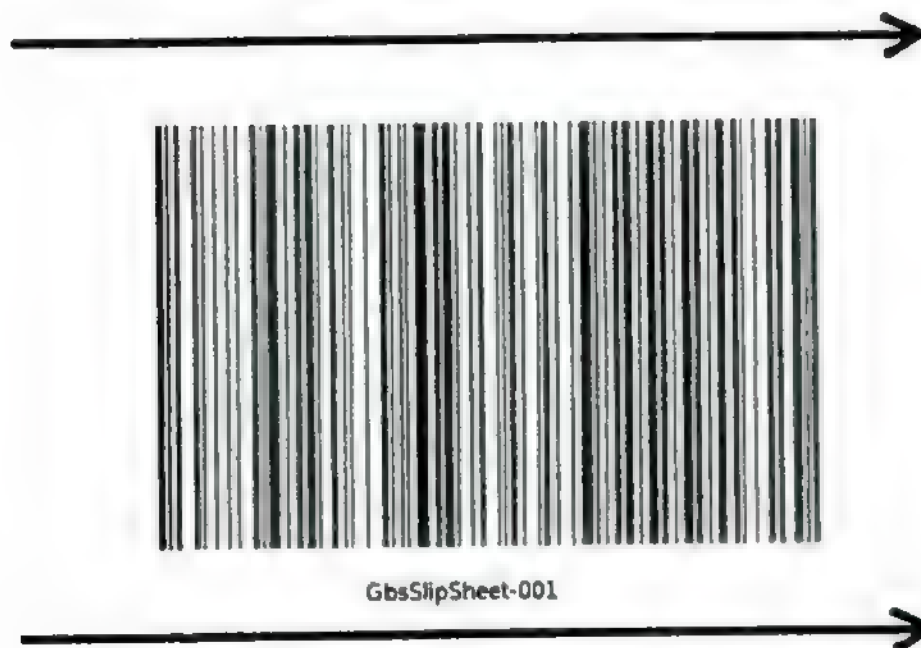
- Go with whichever CPU you choose. We recommend at least the 50 if not the 66MHz with all this power!
- 16 full megabytes of blazing RAM.
- Our screaming 340MB local bus IDE HDD with built-in 128K cache. 12ms seek time!
- Both Teac® floppies.
- Super-fast VESA-standard Diamond Stealth 24VLB graphics adapter gives you 16.7 million colors!
- ZEOS 14" Hi-Res 1024 x 768 non-interlaced VGA color monitor.
- Your choice of Lotus 1-2-3 for Windows, Ami Pro or Freelance Graphics, plus Lotus Organizer, DOS, Windows, and a genuine MS Mouse.





1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

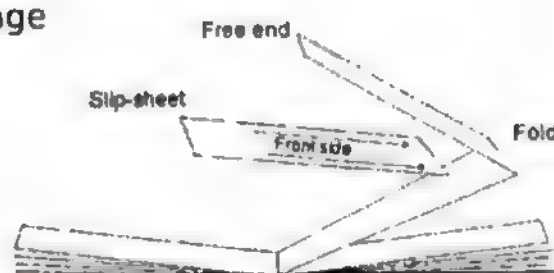
Inverted Foldout slip-sheet



Folded edge of the page

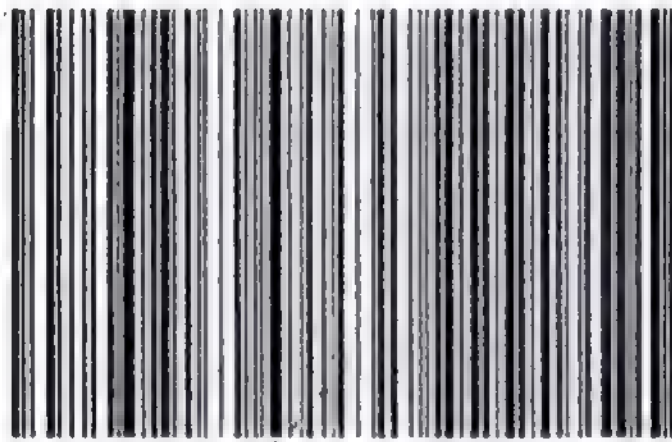
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side

You simply get more. For less. When everyone else began cutting prices by giving less, ZEOS had a better idea—use the very latest technology to design an entirely new line of high-performance upgradables that allow us to charge less while giving more. We did it and you'll love it!

Take A Closer Look.

QUALITY. A ZEOS HALLMARK.

Such as the two cooling fans you'll find in every ZEOS system. While ZEOS systems run cooler than most with one fan, we still give you two whisper-quiet ones. The

cooler your system runs the longer it will last. We also include a built-in surge suppressor in every system. Of course every ZEOS system carries the Underwriters Laboratories listing as well. These are extra features the others can't or won't offer you. But you deserve them, and from ZEOS they're yours. No additional charge.

ZEOS. THE UPGRADABILITY EXPERTS.

ZEOS was one of the first to offer truly high-performance upgradable PCs. Now using the latest in high-integration technology, we've made a good thing even better!

Start with the CPU of your choice. Select between the 486SX-25 or 33, the 486DX-33, the 486DX2-50 or 486DX2-66. Next year, if you choose, you can upgrade all the way to the new super OverDrive processor based on Intel's Pentium™ architecture. Maximum power today *and* tomorrow.

CPU UPGRADABILITY IS ONLY PART OF THE STORY.

In their haste to cut features, the others seem to have forgotten about your future. That's why ZEOS provides eight expansion slots, high-capacity power supplies with built-in surge suppression, and six drive bays in our SpaceSaver desktop cases.

These are the features that will make the difference in your satisfaction down the road. And only ZEOS gives them all to you.

THE MORE YOU LOOK, THE MORE OBVIOUS YOUR ZEOS ADVANTAGES BECOME.

With ZEOS, you get more than just a rosy future. You *start out* with more than anyone else. Today.

We've used the latest technology to incorporate more features than ever before. Features like two VESA-standard local bus slots, on-board local bus IDE and a local bus video card for lightning-fast performance. Flash BIOS for easy BIOS upgrades via disk or modem. Optional secondary cache and on-board SCSI. And much, much more.



FREE LOTUS SOFTWARE, TOO!

And now, when you purchase any new ZEOS Windows-based system, you get your choice of either Lotus 1-2-3 for Windows, Ami Pro, or Freelance Graphics—plus DOS, Windows, and Lotus Organizer, the personal information manager highly recommended by *PC Magazine*. You'd pay hundreds of dollars for this software alone.



And we're giving it to you absolutely free. Now that's ZEOS value.

24-HOUR-A-DAY SUPPORT. AND MORE!

Remember too, ZEOS provides you with our top-rated 24-Hour-A-Day Toll-Free Technical Support. Plus your new ZEOS system is covered by our 30-Day Absolute Satisfaction Money-Back Guarantee, One Full Year Limited Warranty, and our Express Parts Replacement Policy.

CALL NOW AND GET THE BEST.

Ordering your new ZEOS upgradable system is easy. Simply give us a call. A friendly and knowledgeable ZEOS Systems Consultant is ready to answer any questions you may have. So take a closer look. You're going to love your new ZEOS system.

We guarantee it!

CALL NOW TOLL-FREE:

800-554-7172

GET YOURS NOW!



Take Your Pick.
We'll Ship Your Order Today!

RIGHT NOW. GUARANTEED!*

In a hurry for your new system? We can ship your choice of these hot new ZEOS '486s *today!* They're our most popular configurations.

Here's how it works. We have these incredible ZEOS '486 color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit cards are subject to authorization.
3. Orders must be for ZEOS '486 systems configured as shown here. Any other systems or upgrades are custom-built and will take slightly longer.

*OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your system

under the conditions outlined, we will ship at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're high-performance, high-quality ZEOS systems. Packing all the ZEOS value that has won *PC Magazine Editors' Choice*—*nine times!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today!

Call now
Toll Free,
800-554-
7172.



486SX-25	\$2195
486DX-33C	\$2544
486DX2-50C	\$2644
486DX2-66C	\$2744

- Upgradable CPU featuring our Zero Insertion Force (ZIF) upgrade socket makes it easy in the future.
- All except the 486SX-25 feature our 128K SRAM cache.
- 8MB of high-speed RAM.
- A full 245MB high-speed local bus IDE hard drive with built-in 128K cache. 12ms seek time!
- 1.2MB and 1.44MB Teac® floppy drives.
- Super-fast VESA-standard Diamond Stealth 24v18 graphics adapter gives you 16.7 million colors!
- ZEOS 14" Hi-Res 1024x768 non-interlaced VGA color monitor.
- Eight expansion slots including two VESA-standard local bus slots.
- Two serial and one parallel port.
- Shadow RAM and EMS support.
- Flash ROM BIOS.
- High-capacity power supply with built-in surge suppression.
- Rugged ZEOS SpaceSaver case, six bays, and two cooling fans for added reliability, expandability and component life.
- ZEOS R5/101-key keyboard.
- Your choice of Lotus 1-2-3, Ami Pro or Freelance Graphics, plus Lotus Organizer, DOS, Windows and a Microsoft Mouse.
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support, 30-Day Money Back Guarantee and Customer Satisfaction Package.

**ORDER NOW TOLL FREE
800-554-7172**

Fax Orders: 612-633-1325
Government: 800-245-2449
TDD Orders: 800-228-5389
Outside U.S. and Canada:
612-633-6131

MasterCard, VISA, Am Exp,
Discover, Z-Card, COD and
Leasing programs.
Open 24 Hours a Day,
365 Days a Year!



Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. All products and company names are trademarks or registered trademarks of their respective holders. © 1992 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company. NASDAQ symbol: ZEOS. UPGREP PCM 9301B

Circle 151 on reader service card.

A. YOUR PERSONAL INFORMATION

Please complete all appropriate sections, *providing at least two years residence and employment history. THIS IS NOT A CREDIT AGREEMENT!* One will be sent to you upon authorization of an account. (This form must be signed to process your application.) All financed purchases are subject to credit approval. *If you have any credit questions, please call 800-421-8942 for assistance.* Thank you!

Name _____ Previous Address _____
Home Phone (____) _____ City _____ State _____ Zip _____
Soc. Sec. No. _____ Date of Birth _____ Employer _____ Since (Mo./Yr.) _____
Address _____ Apt. _____ Monthly Gross Salary \$ _____ Daytime Bus. Phone _____
City _____ State _____ Zip _____ Previous Employer _____ From _____ To _____
Since (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____ Occupation _____

A married person may apply for individual credit. I am applying for (please check appropriate box)

☐ **JOINT CREDIT** with another person. Complete entire application

☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application

☐ **INDIVIDUAL CREDIT**. Do not complete section C **

** If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation

Additional Monthly Income: \$ _____ Source _____

Name & Address of Nearest Relative Not Living With You _____

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS
☐ married ☐ unmarried ☐ legally separated

Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE A

Checking Account	☐ Yes ☐ No		
Savings Account	☐ Yes ☐ No		
Y/N	How Many?	Y/N	How Many?
Bank Loan	_____	Dept. Store Charge Card	_____
VISA	_____	Credit Union Account	_____
MasterCard	_____	Other Major Charge Cards	_____
Finance Company Loan	_____		

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____
Soc. Sec. No. _____ Date of Birth _____
Address _____ Apt. _____
City _____ State _____ Zip _____
Home Phone (____) _____ Date of Residence (Mo./Yr.) _____
Joint Applicant's Employer _____ Since (Mo./Yr.) _____
Bus. Phone (____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief

Applicant's Signature _____ Date _____

Joint Applicant's Signature _____ Date _____

FOR MARRIED WISCONSIN APPLICANTS I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or write to ZEOS, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report

OH—The Ohio laws against discrimination require that all creditors make credit equally available to all creditworthy customers and that credit reporting agencies maintain separate credit histories on each individual upon request. The Ohio Civil Rights Commission administers compliance with this law

*Financing not available in Alaska, Hawaii or outside the continental U.S.

ZCD-PCM-9301B

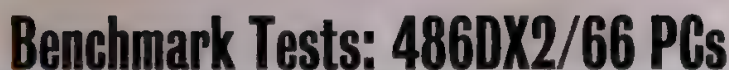
Z-CARD PRIORITY APPLICATION FAX NUMBER: 612-633-7507

Apply for your own Z-CardSM today!



Here's another great reason to buy a ZEOS system: the Z-CardSM! The Z-Card works just like a MasterCard or VISA—so you can charge your ZEOS purchases and pay in easy monthly installments. And since no down payment is required, it makes buying your new ZEOS system easier than ever!

You can apply for your very own Z-Card and low, low monthly payments right now. Simply fill out this application and fax it to 612-633-7507. Or mail it to **ZEOS International, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413**. We'll contact you as soon as your credit line is established, usually within 24 hours of receipt. Apply today!



After close examination of 74 DX2/66-based systems, the evidence is clear: CPU performance is enhanced by the use of a second-level cache. In addition, graphics speed can be significantly improved under both DOS and Windows by the use of a local bus.

We also used the Windows Benchmark Tests (Winbench), Release 3.1, to obtain the Graphics Winmark and Disk Winmark scores, which predict the relative performance levels using popular Windows applications.

The **memory** score is compiled from 8-, 16-, and 32-bit extended-memory read and write tests, as well as 8- and 16-bit conventional-memory read and write tests. Taken together, these tests reflect the throughput of a computer's main memory.

The **disk** score measures throughput using standard DOS INT 21h file I/O calls. The tests measure the speed of file reading and writing, both sequentially and randomly, for a range of file sizes from 256K to 32MB. The tests are performed without software disk caches installed.

The **video** score is based on direct-to-screen text-write and graphics-write tests. Taken together, these tests reflect the video throughput for a standard EGA/VGA adapter running DOS applications.

The **DOSmark** score is a composite rating derived from the processor, memory, video, and disk test scores. The DOSmark indicates a computer system's ability to run DOS applications.

The **Graphics Winmark** score is based on 12 Windows graphics and text functions derived from extensive profiling of popular Windows applications. It is measured in megapixels per second (a megapixel is 1,048,576 pixels).

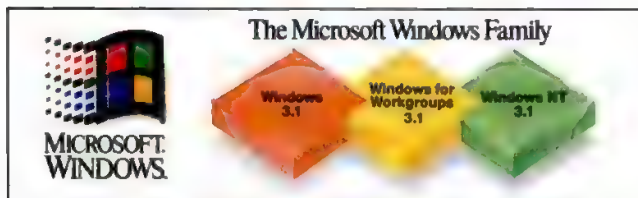
The **Disk Winmark** score is based on testing techniques adapted from the DOS disk tests to reflect operations within the Windows environment. For this portion of the testing, the systems were configured with up to 2MB of SmartDrive cache.

Worst

BEST

To anyone who has
ever dreamed that
personal computing
could be even easier
than it is today.

This is your



Microsoft Windows makes using computers easier for everyone.

To date, millions of people have already opened their eyes to the Microsoft® Windows™ operating system.

Why? Because Windows makes their computing easier. Faster. And more reliable.

But we weren't about to stop there.

After all, people need their computers to do more these days than increase their level of personal productivity.

They need PCs to help them work together. And they need affordable ways to run powerful new programs.

So we've added two new operating systems to the Windows family.

To help people work together, we have just introduced Microsoft Windows for



MICROSOFT WINDOWS 3.1

Microsoft Windows is the business standard in operating systems. It's the foundation for all systems in the Windows family.



MICROSOFT WINDOWS FOR WORKGROUPS 3.1

Windows for Workgroups lets people work together through built-in electronic mail, file sharing, printer sharing and scheduling.

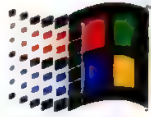


wake-up call.

Workgroups 3.1. It has built-in networking that gives you a whole new level of productivity.

And we'll soon be releasing the Microsoft Windows NT™ 3.1 operating system.

As a server or a desktop, Windows NT makes powerful computing easier. And it's ideal for people who need to use the most powerful hardware and applications available.



MICROSOFT
WINDOWS
READY-TO-RUN

*There's one way to
make sure a new PC is
going to be easier to use.
Just look for this logo.*

But here's the best part: They all share the intuitive Windows interface. And run the same applications. So you can preserve and build on all your investments in Windows.

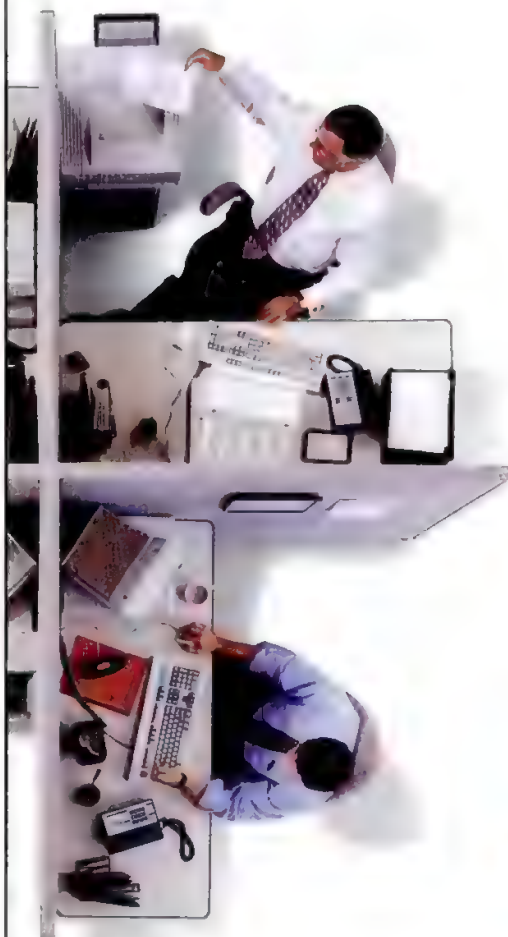
If you'd like more information, call us at (800) 426-9400, Department HM7, for your free 8-page color brochure. It's time for you to get started on a new day.

Microsoft
Making it easier



MICROSOFT WINDOWS NT 3.1

*It's a fully 32-bit, scalable,
multitasking Windows operating
system with built-in networking
capabilities and advanced
security. It will be available to
end users in early 1993.**



Introducing Wind

It's based on the idea th
require a generous a

All it takes is a few clicks of the mouse to share files and share information. No more long walks down the hall.

Now several people can share printers, so everyone can use the printer that best suits their needs, just by clicking a button.

MICROSOFT WINDOWS FOR WORKGROUPS

Since we've included Microsoft Mail, you can instantly send electronic mail to individuals or everyone in your workgroup. You can even add sounds and pictures.

We've also included Microsoft Schedule+, so you can manage calendars and schedule meetings with others. And you can spend more of your workday actually working.

ows for Workgroups. at business relationships mount of give and take.

As anyone in business would tell you, success often depends on how well you can work with others.

Not coincidentally, this is the strength of the Microsoft® Windows™ for Workgroups 3.1 operating system.

In fact, with its built-in networking, one could describe Windows for Workgroups as downright gregarious.



The file manager toolbar lets you use your network as fast as you can point and click. It gives you access to commonly used functions, such as sharing files and sending documents, at the touch of a button. How could sharing information be any easier?

For starters, you can say goodbye to the old "mind if I borrow your disk" routine. With Windows for Workgroups, you'll be able to share files and applications, even printers, faster than you can say "eject."

And then there's this handy little feature called Schedule+.

Say you want a meeting on Tuesday with Matt, who has a meeting with Duncan and Karen, who, wouldn't you know it, are meeting with Jim that same day.

No problem.

Just a couple of clicks and, zip, everyone's schedules are laid out right in front of you. So you can book a meeting without making a jillion phone calls.

Even things as basic as sending memos are simplified with Microsoft Windows for Workgroups. Now you can send electronic mail, including voice and graphics, to anyone in your workgroup.

In other words, Windows for Workgroups lets you share something with your coworkers other than frustration.

But just because it has these advanced capabilities doesn't mean that you'll need an advanced degree to understand it.

Quite the contrary.

Microsoft Windows for Workgroups is based on the familiar interface that millions

of people have come to love. Even if you've never used Windows, it's the ideal starter network.

And since it works with Windows-based and MS-DOS® applications just like Windows 3.1, you can preserve and build on any investment you make in Windows.

Which brings up our final point.

Windows for Workgroups is great for creating workgroups on existing networks, like LAN Manager and NetWare®, as well.

All in all, Microsoft Windows for Workgroups will give you an entirely new level of productivity.

To find out more, go to your local computer retailer. Or call us at (800) 426-9400, Dept. HM7, for the store nearest you.

Once you find out everything it can do, you'll want to share it with everyone.



Microsoft
Making it easier



Benchmark Tests: 486DX2/66 PCs

CONTINUES

MEMORY

Bytes per second	0	3,000	6,000	9,000
Ace Power 486 DX2/66 Model 5657				4,281
AcP Express 3.0T 486/66				7,947
American Machine 1,4466				3,045
American Super Computer 486X2 e66				8,650
Arch Computer 486 66DX2				5,218
Arch Computer 486 66DX2				6,275
Arch 486 66DX2 v. Bus				6,275
Arch 486 66DX2 v. Bus				6,178
AST Express 4 66				4,453
AST Express AT 486 66				6,249
Austin 486 X2 Win Station				4,463
B... 486DX2/66				8,301
B... 486DX2/66				4,463
B... 486DX2/66				8,301
B... 486DX2/66				3,820
B... 486DX2/66				8,658
B... 486DX2/66				5,537
B... 486DX2/66				6,124
B... 486DX2/66				6,254
B... 486DX2/66				8,629
B... 486DX2/66				3,802
B... 486DX2/66				4,708
B... 486DX2/66				8,510
B... 486DX2/66				10,156
B... 486DX2/66				3,865
B... 486DX2/66				6,917
B... 486DX2/66				4,659
B... 486DX2/66				9,582
B... 486DX2/66				6,578
B... 486DX2/66				7,178
B... 486DX2/66				7,273
B... 486DX2/66				5,071
B... 486DX2/66				6,070
B... 486DX2/66				6,239
B... 486DX2/66				7,004
B... 486DX2/66				8,238
B... 486DX2/66				8,589
B... 486DX2/66				4,314
B... 486DX2/66				8,283
B... 486DX2/66				8,301
B... 486DX2/66				5,871
B... 486DX2/66				5,867
B... 486DX2/66				7,888
B... 486DX2/66				6,270
B... 486DX2/66				4,867
B... 486DX2/66				8,858
B... 486DX2/66				4,235
B... 486DX2/66				4,948
B... 486DX2/66				7,822
B... 486DX2/66				4,676
B... 486DX2/66				10,282
B... 486DX2/66				4,581
B... 486DX2/66				5,867
B... 486DX2/66				5,881
B... 486DX2/66				4,414
B... 486DX2/66				3,588
B... 486DX2/66				5,522
B... 486DX2/66				8,310
B... 486DX2/66				8,301
B... 486DX2/66				6,114
B... 486DX2/66				5,537
B... 486DX2/66				3,924
B... 486DX2/66				4,767
B... 486DX2/66				6,875
B... 486DX2/66				7,329
B... 486DX2/66				4,883
B... 486DX2/66				9,416
B... 486DX2/66				5,586
B... 486DX2/66				5,466
B... 486DX2/66				5,857
B... 486DX2/66				7,330
B... 486DX2/66				4,962
B... 486DX2/66				6,985
B... 486DX2/66				4,152

WORST

BEST

VIDEO

Thousands of operations per second	0	3,000	6,000	9,000
Ace Power 486 DX2/66 Model 5657				6,424
AcP Express 3.0T 486/66				4,632
American Machine 1,4466				1,285
American Super Computer 486X2 e66				2,903
Arch Computer 486 66DX2				5,256
Arch 486 66DX2 v. Bus				4,350
Arch 486 66DX2 v. Bus				7,013
AST Express 4 66				3,759
AST Express AT 486 66				1,732
Austin 486 X2 Win Station				7,007
B... 486DX2/66				1,789
B... 486DX2/66				2,654
B... 486DX2/66				3,701
B... 486DX2/66				3,183
B... 486DX2/66				2,644
B... 486DX2/66				4,998
B... 486DX2/66				2,627
B... 486DX2/66				1,885
B... 486DX2/66				2,766
B... 486DX2/66				6,159
B... 486DX2/66				4,865
B... 486DX2/66				9,955
B... 486DX2/66				3,466
B... 486DX2/66				2,970
B... 486DX2/66				4,395
B... 486DX2/66				2,811
B... 486DX2/66				2,106
B... 486DX2/66				2,414
B... 486DX2/66				2,610
B... 486DX2/66				4,473
B... 486DX2/66				2,805
B... 486DX2/66				1,628
B... 486DX2/66				2,935
B... 486DX2/66				6,982
B... 486DX2/66				1,037
B... 486DX2/66				3,390
B... 486DX2/66				1,848
B... 486DX2/66				7,215
B... 486DX2/66				3,865
B... 486DX2/66				2,216
B... 486DX2/66				5,124
B... 486DX2/66				9,504
B... 486DX2/66				3,281
B... 486DX2/66				7,047
B... 486DX2/66				1,632
B... 486DX2/66				2,928
B... 486DX2/66				2,569
B... 486DX2/66				10,206
B... 486DX2/66				3,094
B... 486DX2/66				2,315
B... 486DX2/66				5,326
B... 486DX2/66				5,908
B... 486DX2/66				9,489
B... 486DX2/66				6,602
B... 486DX2/66				4,661
B... 486DX2/66				1,357
B... 486DX2/66				3,271
B... 486DX2/66				2,523
B... 486DX2/66				2,677
B... 486DX2/66				1,663
B... 486DX2/66				2,622
B... 486DX2/66				1,269
B... 486DX2/66				4,633
B... 486DX2/66				1,249
B... 486DX2/66				2,764
B... 486DX2/66				2,428
B... 486DX2/66				3,406
B... 486DX2/66				1,754
B... 486DX2/66				3,097
B... 486DX2/66				1,547
B... 486DX2/66				1,146
B... 486DX2/66				9,770
B... 486DX2/66				4,296
B... 486DX2/66				1,967

WORST

BEST

Don't send your words out naked into the world.

Dress them up with Microsoft® TrueType® Font Packs for the Microsoft Windows™ operating system version 3.1 and Windows-based applications.

Because now, in addition to the original Microsoft TrueType Font Pack, you can have more ways than ever to make your point.

Introducing TrueType Font Pack 2.



It has more headline fonts. More decorative fonts. More Wingdings™. More great ways to express yourself in memos, letters and other documents.

(By the way, Font Pack 2 also has a handy type organizer called Font Assistant. It's like an electronic chest of drawers for your fonts.)

We even have a font set to update your HP® printer called, you guessed it, Microsoft Hewlett-Packard® Font Set.

So your ideas can always be dressed to a T. In fact, even your T's can be dressed to a T.

Which is important when your words are out there for all the world to see.

Microsoft
Making it easier



A FRIENDLY REMINDER

Unfortunately, we have not received payment for the 12 Tahitian Swayback Guppies you ordered. It may have just slipped your mind. Or, more likely, you've already sent in your payment, so just ignore this notice. We don't know what got into us. Sorry to bother you.

You're special to us.



2nd Notice

Your account is now 60 days **PAST DUE**. We hope you are paying more attention to your guppies than you are to us. Remit your payment to avoid further action.

Please pay your bill so we can pay our bills.



3rd and FINAL NOTICE

Your account is now **Seriously Delinquent**. If you do not pay the total amount due by Friday midnight, your guppies will be repossessed, your credit damaged and your fishing license revoked.

Remember, we know where your guppies live.



Thank You

We appreciate your prompt payment. As always, we value your patronage and we look forward to seeing you soon.

P.S. By now, you've discovered the phenomenal rate at which a Tahitian Swayback Guppy grows. Coincidentally, for a limited time, our 100-gallon aquariums are now on sale.

Have a nice day!



Benchmark Tests: 486DX2/66 PCs

CONTINUES

DISK

Kilobytes per second	0	50	100	150	200	
AcerPower 486e DX2/66 Model 5657						25.81
ALR Flyer 32DT 4DX2/66						23.83
American Mitac TL4466						100.20
American Super Computer 486X2/e66						32.20
Arche Legacy 486/66DX2						23.68
Ares 486 66DX2 VL-Bus						25.41
Ariel 486DX2-66VLB						24.77
AST Bravo 4/66d						32.77
ATronics ATI-486-66						117.06
Austin 486DX2 WinStation						24.05
Bi-Link Desktop 486DX2/66						23.34
BLK 486DX2/66						23.34
Blue Star 466D2U						26.87
BOSS 486d						38.10
Broadax 486DX2-66						28.00
C2 Saber 486/e DX2-66						40.14
CAF Gold 602						25.14
Clover 486 Quick-I Series						37.76
Comex 486DX2/66						24.74
Compaq Deskpro 66M						28.41
CompuAdd 466E						37.48
CompuAdd Express 466DX2 Scalable						27.15
Comtrade 486 EISA Dream Machine						76.90
Dell 466DE/2						38.12
DFI 486-66DX2						108.38
Diamond DX2-66						33.46
Digital DECpc 466d2 LP						37.35
Edge 466 Magnum						200.55
EPS ISA 486 DX2/66						36.70
Everex Tempo M Series 486 DX2/66						38.94
Expo 486 dX2/66						38.71
FCS 486-66						38.28
FutureTech System 462E						102.27
Gateway 2000 4DX2-66V						38.85
GCH EasyData 486DX-2/66						36.23
Gecco 466E						32.25
HP Vectra 486/66U						38.14
Hyundai 466D2						28.00
IBM PS/2 Model 77 486DX2						104.86
IDS 466i2						41.42
Insight 486DX2-66i						43.41
Int. Instr. Blue Max Monolith 486D2/66UP						117.13
Keydata 486DX2-66 KeyStation						33.79
Lightning ThunderBox						26.71
LodeStar 486-DX2/66 EISA WinStation						105.30
Mega Impact 486DX2/66E+						52.30
Memorex Telex 8092-66						23.83
Micro Express ME 486-Local Bus/DX2/66						100.00
Naga Windows Workstation						33.46
National Microsystems Flash 486DX2-66E						100.10
NCR System 3350						32.85
NEC Express DX2/66e						27.84
NETiS Ultra WinStation N466L						93.48
Northgate SlimLine ZXP						28.00
Occidental 66MHz 486DX2						28.37
Osicom 466 MOD 420						44.43
PC Brand Leader Cache 486/DX2-66						22.85
PC Pros 486/66DX2 5550T						27.37
PCS Double Pro-66						37.81
Poly 486-66LM						44.90
QSI Klonimus 486DX2/66						23.23
Qtech 486 402/66						24.50
Silicon Pylon II 486DXi-212						30.00
SST 486DX2-66MWC						35.30
Standard Windows Workstation Plus						26.24
Swan 486DX2-66DB						26.57
Tangent Model 466ex						96.28
Tri-Star 66/DX2-VL						27.30
Twinhead Superset 600/462D						22.81
USA Flex 486DX2/66						38.12
U.S. Micro Jet 486DX2-66						38.10
Wyse Decision 486si						29.51
ZDS Z-Station 486Xh Model 200						37.78
Zeos 486DX2-66						27.00

WORST

BEST

DOSMARK

	0	20	40	60	80	
AcerPower 486e DX2, 66 Model 5657						28.42
ALR Flyer 32DT 4DX2/66						33.86
American Mitac TL4466						60.01
American Super Computer 486X2/e66						26.06
Arche Legacy 486/66DX2						31.49
Ares 486 66DX2 VL-Bus						29.87
Arie 486DX2 66VLB						29.37
AST Bravo 4/66d						35.54
ATronics ATI 486 66						90.90
Austin 466DX2 WinStation						28.72
Bi-Link Desktop 486DX2/66						30.44
BLK 486DX2 66						34.40
Blue Star 466D2U						25.30
BOSS 486d						41.53
Broadax 486DX2 66						28.00
C2 Saber 486/e DX2 66						40.06
CAF Gold 602						29.11
Clover 486 Quick-I Series						36.70
Comex 486DX2/66						29.21
Compaq Deskpro 66M						34.83
CompuAdd 466E						34.70
CompuAdd Express 466DX2 Scalable						23.06
Comtrade 486 EISA Dream Machine						65.18
Dell 466DE/2						42.22
DFI 486 66DX2						84.97
Diamond DX2-66						36.83
Digital DECpc 466d2 LP						36.39
Edge 466 Magnum						96.50
EPS ISA 486 DX2 66						37.70
Everex Tempo M Series 486 DX2/66						35.06
Expo 486 dX2/66						41.80
FCS 486 66						32.43
FutureTech System 462E						65.53
Gateway 2000 4DX2-66V						34.32
GCH EasyData 486DX 2/66						36.96
Gecco 466E						36.97
HP Vectra 486/66U						37.80
Hyundai 466D2						28.05
IBM PS/2 Model 77 486DX2						43.75
IDS 466i2						43.74
Insight 486DX2-66i						41.19
Int. Instr. Blue Max Monolith 486D2/66UP						64.87
Keydata 486DX2 66 KeyStation						37.17
Lightning ThunderBox						31.83
LodeStar 486-DX2/66 EISA WinStation						57.08
Mega Impact 486DX2/66E+						47.35
Memorex Telex 8092-66						30.55
Micro Express ME 486-Local Bus/DX2/66						60.21
Naga Windows Workstation						36.96
National Microsystems Flash 486DX2-66E						60.31
NCR System 3350						38.26
NEC Express DX2/66e						25.24
NETiS Ultra WinStation N466L						98.67
Northgate SlimLine ZXP						28.01
Occidental 66MHz 486DX2						28.30
Osicom 466 MOD 420						36.43
PC Brand Leader Cache 486/DX2-66						22.72
PC Pros 486/66DX2 5550T						28.76
PCS Double Pro-66						41.10
Poly 486 66LM						43.28
QSI Klonimus 486DX2/66						27.40
Qtech 486 402-66						26.25
Silicon Pylon II 486DXi-212						32.21
SST 486DX2 66MWC						36.70
Standard Windows Workstation Plus						29.11
Swan 486DX2 66DB						29.07
Tangent Model 466ex						73.33
Tri-Star 66/DX2-VL						30.96
Twinhead Superset 600/462D						26.10
USA Flex 486DX2/66						30.80
U.S. Micro Jet 486DX2 66						37.92
Wyse Decision 486si						32.11
ZDS Z-Station 486Xh Model 200						36.08
Zeos 486DX2-66						29.00

WORST

BEST

Sorry, you're going to have to plug it in yourself.

By now, you really should know that the Microsoft® Windows™ operating system makes computing easier.

Now Microsoft is working with personal computer manufacturers to make it even easier for you to get up and running.

We call it Microsoft Windows Ready-to-Run. Quite simply, when you see the Ready-to-Run logo, it means that a PC already has Microsoft Windows installed.

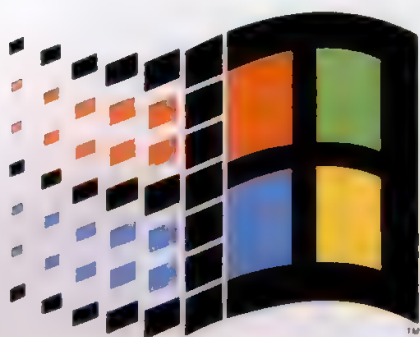
There is no need for installation disks. No set-up procedures. No additional steps.

What's more, it means the personal computer has already been optimized to run Windows-based applications.

Just flip a switch and you're ready to start working with Microsoft Windows.

Oh, there is one little technical matter concerning an electrical plug and a wall outlet. We apologize for any inconvenience this may cause.

Microsoft®
Making it easier

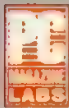
© 1992 Microsoft Corporation. All rights reserved. Printed in the United States of America. For more information inside the 50 United States, call (800) 426-9400, Dept. HM7. Outside the U.S. and Canada, call (206) 936-8661. Customers in Canada, call (800) 563-9048. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corporation.

MICROSOFT
WINDOWS
READY-TO-RUN

THIS
SIDE
UP



COMPUTER



Benchmark Tests: 486DX2/66 PCs

CONTINUES

DISK

Kilobytes per second	0	50	100	150	200
AcerPower 486e DX2/66 Model 5657					20.01
ALR Flyer 32DT 4DX2/66					28.83
American Mitac TL4466					180.20
American Super Computer 486X2/e66					32.29
Arche Legacy 486/66DX2					28.88
Ares 486-66DX2 VL-Bus					25.41
Ariel 486DX2-66VLB					24.77
AST Bravo 4/66d					32.77
ATronics ATI-486-66					117.06
Austin 486DX2 WinStation					24.05
Bi-Link Desktop 486DX2/66					29.34
BLK 486DX2/66					29.34
Blue Star 466D2U					36.87
BOSS 486d					38.10
Broadax 486DX2-66					28.90
C2 Saber 486/e DX2-66					40.14
CAF Gold 602					25.14
Clover 486 Quick-I Series					37.78
Comex 486DX2/66					24.74
Compaq Deskpro 66M					29.41
CompuAdd 466E					37.48
CompuAdd Express 466DX2 Scalable					27.15
Comtrade 486 EISA Dream Machine					78.98
Dell 466DE/2					38.12
DFI 486-66DX2					108.38
Diamond DX2-66					33.48
Digital DECpc 466d2 LP					37.38
Edge 466 Magnum					288.55
EPS ISA 486 DX2/66					36.78
Everex Tempo M Series 486 DX2/66					38.94
Expo 486 dx2/66					39.71
FCS 486-66					38.29
FutureTech System 462E					192.27
Gateway 2000 4DX2-66V					38.05
GCH EasyData 486DX-2/66					36.23
Gecco 466E					32.25
HP Vectra 486/66U					36.14
Hyundai 466D2					28.88
IBM PS/2 Model 77 486DX2					104.86
IDS 466/2					41.42
Insight 486DX2-66i					43.41
Int Instr Blue Max Monolith 486D2/66UP					117.13
Keydata 486DX2-66 KeyStation					33.79
Lightning ThunderBox					28.71
LodeStar 486-DX2/66 EISA WinStation					195.38
Mega Impact 486DX2/66E+					52.30
Memorex Telex 8092-66					29.83
Micro Express ME 486-Local Bus/DX2/66					158.08
Naga Windows Workstation					33.46
National Microsystems Flash 486DX2-66E					108.18
NCR System 3350					32.85
NEC Express DX2/66e					21.84
NET/S Ultra WinStation N466L					93.48
Northgate SlimLine ZXP					28.00
Occidental 66MHz 486DX2					28.37
Osicom 466 MOD 420					44.43
PC Brand Leader Cache 486/DX2-66					22.85
PC Pros 486/66DX2 5550T					27.37
PCS Double Pro-66					37.81
Poly 486-66LM					44.80
QSI Kionimus 486DX2/66					23.23
Qtach 486 4D2/66					24.88
Silicon Pylon II 486DXi-212					38.08
SST 486DX2-66MWC					35.38
Standard Windows Workstation Plus					28.24
Swan 486DX2-66DB					28.57
Tangent Model 466ex					98.28
Tri-Star 66/DX2-VL					27.98
Twinhead Superset 600/462D					22.91
USA Flex 486DX2/66					38.12
U.S. Micro Jet 486DX2-66					36.10
Wyse Decision 486s					29.91
ZDS Z-Station 486Xh Model 200					37.78
Zeos 486DX2-66					27.88

WORST

BEST

DOSMARK

	0	20	40	60	80
AcerPower 486e DX2/66 Model 5657					28.42
ALR Flyer 32DT 4DX2/66					33.88
American Mitac TL4466					68.01
American Super Computer 486X2 e66					35.85
Arche Legacy 486/66DX2					31.49
Ares 486 66DX2 V.L. Bus					29.87
Ariel 486DX2-66VLB					29.37
AST Bravo 4 66i					35.54
ATronics ATI-486-66					58.98
Austin 466DX2 WinStation					28.72
Bi-Link Desktop 486DX2/66					30.44
BLK 486DX2/66					34.48
Blue Star 466D2U					35.38
BOSS 486d					41.53
Broadax 486DX2-66					28.88
C2 Saber 486/e DX2-66					40.88
CAF Gold 8D2					28.11
Clover 486 Quick-I Series					38.78
Comex 486DX2/66					28.21
Compaq Deskpro 66M					34.93
CompuAdd 466E					34.78
CompuAdd Express 466DX2 Scalable					29.88
Comtrade 486 EISA Dream Machine					65.18
Dell 466DE/2					42.22
DFI 486 66DX2					54.97
Diamond DX2 66					38.53
Digital DECpc 466d2 LP					36.38
Edge 466 Magnum					98.58
EPS ISA 486 DX2/66					37.78
Everex Tempo M Series 486 DX2/66					35.88
Expo 486 dx2/66					41.80
FCS 486-66					32.43
FutureTech System 462E					65.53
Gateway 2000 4DX2 66v					34.32
GCH EasyData 486DX 2/66					38.98
Gecco 466E					38.97
HP Vectra 486/66U					37.88
Hyundai 466D2					28.55
IBM PS/2 Model 77 486DX2					63.75
IDS 466/2					43.74
Insight 486DX2-66i					41.19
Int Instr Blue Max Monolith 486D2/66UP					64.87
Keydata 486DX2-66 KeyStation					37.17
Lightning ThunderBox					31.83
LodeStar 486 DX2/66 EISA WinStation					57.88
Mega Impact 486DX2/66E+					47.35
Memorex Telex 8092-66					30.55
Micro Express ME 486-Local Bus/DX2/66					68.21
Naga Windows Workstation					38.58
National Microsystems Flash 486DX2 66E					58.31
NCR System 3350					38.26
NEC Express DX2/66e					25.24
NET/S Ultra WinStat on N466L					58.87
Northgate SlimLine ZXP					28.91
Occidental 66MHz 486DX2					28.98
Osicom 466 MOD 420					38.43
PC Brand Leader Cache 486/DX2-66					28.72
PC Pros 486/66DX2 5550T					32.75
PCS Double Pro-66					41.10
Poly 486-66LM					43.28
QSI Kionimus 486DX2/66					27.48
Qtach 486 4D2/66					28.25
Silicon Pylon II 486DXi-212					32.21
SST 486DX2-66MWC					38.78
Standard Windows Workstation Plus					28.11
Swan 486DX2 66DB					28.67
Tangent Model 466ex					73.33
Tri-Star 66/DX2-VL					38.98
Twinhead Superset 600/462D					28.18
USA Flex 486DX2/66					38.68
U.S. Micro Jet 486DX2-66					37.52
Wyse Decision 486s					32.11
ZDS Z-Station 486Xh Model 200					38.88
Zeos 486DX2-66					29.88

WORST

BEST

Sorry, you're going to have to plug it in yourself.

By now, you really should know that the Microsoft® Windows™ operating system makes computing easier.

Now Microsoft is working with personal computer manufacturers to make it even easier for you to get up and running.

We call it Microsoft Windows Ready-to-Run. Quite simply, when you see the Ready-to-Run logo, it means that a PC already has Microsoft Windows installed.

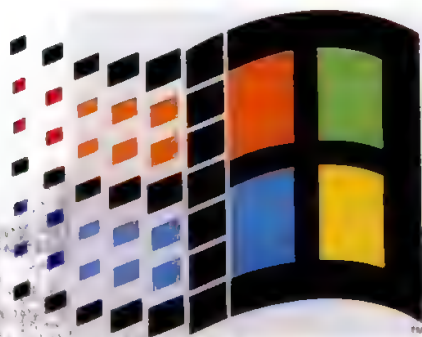
There is no need for installation disks. No set-up procedures. No additional steps.

What's more, it means the personal computer has already been optimized to run Windows-based applications.

Just flip a switch and you're ready to start working with Microsoft Windows.

Oh, there is one little technical matter concerning an electrical plug and a wall outlet. We apologize for any inconvenience this may cause.

Microsoft®
Making it easier

© 1992 Microsoft Corporation. All rights reserved. Printed in the United States of America. For more information inside the 50 United States, call (800) 426-9400, Dept. HM7. Outside the U.S. and Canada, call (206) 936-8661. Customers in Canada, call (800) 563-9048. Microsoft is a registered trademark and Windows and the Windows logo are trademarks of Microsoft Corporation.

**MICROSOFT
WINDOWS
READY-TO-RUN**

**THIS
SIDE
UP**



COMPUTER



Benchmark Tests: 486DX2/66 PCs

ENDS

GRAPHICS WINMARK

Megapixels per second	0	10	20	30	40	
AcerPower 486e DX2/66 Model 5657						18.02
ALR Flyer 32DT 4DX2/66						5.82
American Mitac TL4466						6.25
American Super Computer 486X2/e66						7.44
Arche Legacy 486/66DX2						4.47
Ares 486-66DX2 VL-Bus						10.24
Ariel 486DX2-66VL8						15.62
AST Bravo 4/66d						4.45
ATronics ATI-486-66						6.82
Austin 466DX2 WinStation						22.99
Bi-Link Desktop i486DX2/66						8.82
BLK 486DX2/66						1.78
Blue Star 466D2U						7.98
BOSS 486d						8.83
Broadax 486DX2-66						2.41
C2 Saber 486/e DX2-66						18.09
CAF Gold 6D2						4.61
Clover 486 Quick-I Series						6.58
Comex 486DX2/66						7.82
Compaq Deskpro 66M						12.34
CompuAdd 466E						5.65
CompuAdd Express 466DX2 Scalable						5.55
Comtrade 486 EISA Dream Machine						4.21
Dell 466DE/2						7.44
DFI 486-66DX2						1.42
Diamond DX2-66						7.34
Digital DECpc 466d2 LP						9.02
Edge 466 Magnum						10.01
EPS ISA 486 DX2/66						6.85
Everex Tempo M Series 486 DX2/66						2.88
Expo 486 dX2/66						7.82
FCS 486-66						5.49
FutureTech System 462E						7.64
Gateway 2000 4DX2-66V						21.18
GCH EasyData 486DX-2/66						5.80
Gecco 466E						2.04
HP Vectra 486/66U						8.29
Hyundai 466D2						22.66
IBM PS/2 Model 77 486DX2						7.06
IDS 466i2						7.00
Insight 486DX2-66i						4.88
Int Instr Blue Max Monolith 486D2/66UP						7.97
Keydata 486DX2-66 KeyStation						2.98
Lightning ThunderBox						18.11
LodeStar 486-DX2/66 EISA WinStation						6.18
Mega Impact 486DX2/66E+						7.45
Memorex Telex 8092-66						2.42
Micro Express ME 486-Local Bus/DX2/66						5.27
Naga Windows Workstation						2.76
National Microsystems Flash 486DX2-66E						10.32
NCR System 3350						4.24
NEC Express DX2/66e						4.17
NETIS Ultra WinStation N466L						5.06
Northgate SlimLine ZXP						6.87
Occidental 66MHz 486DX2						6.33
Osicom i466 MOD 420						6.03
PC Brand Leader Cache 486/DX2-66						1.76
PC Pros 486/66DX2 5550T						12.62
PCS Double Pro-66						1.94
Poly 486-66LM						7.68
QSI Klonimus 486DX2/66						6.98
Qtech 486 4D2/66						5.27
Silicon Pylon II 486DXi-212						6.76
SST 486DX2-66MWC						6.59
Standard Windows Workstation Plus						7.23
Swan 486DX2-66DB						10.24
Tangent Model 466ex						9.58
Tri-Star 66/DX2-VL						20.09
Twinhead Superset 600/462D						4.61
USA Flex 486DX2/66						6.66
U S Micro Jet 486DX2-66						5.61
Wyse Decision 486si						5.33
ZDS Z-Station 486Xh Model 200						6.89
Zeos 486DX2-66						42.64

WORST

BEST

DISK WINMARK

Kilobytes per second	0	30	60	90	120	
AcerPower 486e DX2/66 Model 5657						43.77
ALR Flyer 32DT 4DX2/66						40.51
American Mitac TL4466						50.36
American Super Computer 486X2/e66						44.13
Arche Legacy 486/66DX2						43.64
Ares 486-66DX2 VL-Bus						45.26
Ariel 486DX2-66VL8						48.31
AST Bravo 4/66d						41.58
ATronics ATI-486-66						28.22
Austin 466DX2 WinStation						45.77
Bi-Link Desktop i486DX2/66						40.80
BLK 486DX2/66						39.47
Blue Star 466D2U						41.32
BOSS 486d						47.78
Broadax 486DX2-66						34.78
C2 Saber 486/e DX2-66						43.46
CAF Gold 6D2						42.14
Clover 486 Quick-I Series						38.27
Comex 486DX2/66						40.45
Compaq Deskpro 66M						35.40
CompuAdd 466E						46.31
CompuAdd Express 466DX2 Scalable						27.75
Comtrade 486 EISA Dream Machine						29.06
Dell 466DE/2						45.46
DFI 486-66DX2						28.01
Diamond DX2-66						53.15
Digital DECpc 466d2 LP						39.44
Edge 466 Magnum						141.57
EPS ISA 486 DX2/66						42.57
Everex Tempo M Series 486 DX2/66						50.72
Expo 486 dX2/66						51.85
FCS 486-66						44.26
FutureTech System 462E						60.12
Gateway 2000 4DX2-66V						53.84
GCH EasyData 486DX-2/66						46.05
Gecco 466E						44.00
HP Vectra 486/66U						35.88
Hyundai 466D2						31.60
IBM PS/2 Model 77 486DX2						40.13
IDS 466i2						55.30
Insight 486DX2-66i						41.93
Int Instr Blue Max Monolith 486D2/66UP						28.62
Keydata 486DX2-66 KeyStation						48.11
Lightning ThunderBox						43.22
LodeStar 486-DX2/66 EISA WinStation						41.82
Mega Impact 486DX2/66E+						40.44
Memorex Telex 8092-66						33.93
Micro Express ME 486-Local Bus/DX2/66						87.08
Naga Windows Workstation						47.25
National Microsystems Flash 486DX2-66E						54.99
NCR System 3350						48.30
NEC Express DX2/66e						50.22
NETIS Ultra WinStation N466L						38.24
Northgate SlimLine ZXP						51.69
Occidental 66MHz 486DX2						41.72
Osicom i466 MOD 420						46.28
PC Brand Leader Cache 486/DX2-66						27.94
PC Pros 486/66DX2 5550T						39.85
PCS Double Pro-66						45.40
Poly 486-66LM						48.11
QSI Klonimus 486DX2/66						38.92
Qtech 486 4D2/66						35.95
Silicon Pylon II 486DXi-212						40.11
SST 486DX2-66MWC						43.79
Standard Windows Workstation Plus						36.79
Swan 486DX2-66DB						38.55
Tangent Model 466ex						26.43
Tri-Star 66/DX2-VL						47.24
Twinhead Superset 600/462D						33.46
USA Flex 486DX2/66						42.95
U S Micro Jet 486DX2-66						47.61
Wyse Decision 486si						36.50
ZDS Z-Station 486Xh Model 200						44.67
Zeos 486DX2-66						47.75

WORST

BEST

The ECOSYS a-Si Printer for the living world.

Only the Kyocera Corporation's dedication to preserving Earth's precious environment could have resulted in the ECOSYS™ amorphous silicon printer.

Drawing on its worldwide resources, Kyocera developed a new page printer with so radical a design ... it totally eliminates the need for the over 16 million laser cartridges that conventional laser printers spew into the environment, every year.

ECOSYS doesn't use pollution causing cartridges. With ECOSYS, you're helping with the solution, not adding to the problem.



1992
- WINNER -
PC Magazine Award
for Technical Excellence



Winner



PRINTERS

Kyocera Ecosys a-Si Printer FS-1500A
Kyocera Electronics, Inc.



November 24, 1992
Ecosys a-Si Printer FS-1500A



ECOSYS
a-Si PRINTER™

SUITABILITY TO TASK

ALR Flyer 32DT 4DX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

expansion slots (mounted perpendicular to the motherboard), so you should probably figure on opening and closing the case often in order to upgrade. But since all of the necessities (I/O, disk controllers, video, and even an ALR two-button bus mouse) are taken care of on-board, you don't have to upgrade the Flyer to use it effectively.

The Flyer managed average performances on all of our various benchmark tests, achieving a slightly below-average overall DOS rating. Its only real weakness was the lack of attention to a powerful video controller. The integrated Western Digital graphics controller with 512K of video memory just couldn't keep up with the high-end video subsystems offered by the best in this group. The 14-inch ALR FlexVIEW 3X monitor could manage only a maximum noninterlaced

resolution of 800-by-600.

The system comes with a one-year warranty on parts and labor and includes on-site for a \$9.95 fee.—OR

American Mitac Corp.

American Mitac TL4466

At \$3,499, the American Mitac TL4466 is a moderately priced EISA system that yielded some surprising performance test scores. Disk performance was its strong suit: A Mylex caching disk controller with a 4MB RAM cache pushed the 380MB Maxtor drive into second place on the



The American Mitac TL4466

DOS disk test routines and into tenth place under Microsoft Windows.

Seven snap-on bays, all externally accessible, allow quick installation and replacement. The power, reset, and keyboard lock switches are located on the front panel, as are the power, turbo, and hard disk LEDs. The Mitac motherboard, which uses both VLSI and discrete

SUITABILITY TO TASK

American Mitac TL4466

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

logic chips, looks somewhat cluttered but is virtually free of jumpers. It has a Phoenix BIOS and can hold 64MB RAM for a system total. There is no alternate processor socket.

The video circuitry was located on a Mylex video adapter with an S3 chip set and 1MB video RAM. The monitor, a 15-inch flicker-free unit manufactured by American Mitac, was clear and crisp un-

FACT FILE

American Mitac TL4466

American Mitac Corp., 48571 Milmont Dr.,
Fremont, CA 94538; 800-777-1688,
510-623-5300; fax, 510-623-5900

List price (tested configuration): \$3,499.

Memory and processor RAM cache: 8MB 80-ns. DRAM, 128K cache.

Disk drives and controller: Maxtor XT-8380S 380MB SCSI hard disk, Mylex DCE376 caching disk controller with 4MB of memory, 1.44MB floppy disk drive.

Display: Mylex GLE-911 graphics adapter with an S3 chip set and 1MB of video DRAM, 15-inch Mitac M1558 monitor with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: American Mitac Corp.'s latest desktop offering is an EISA-based system that performed superbly on PC Magazine Labs' DOS and Windows disk test routines: Although performance on the DOS processor test suite was good, the Mitac fetched disappointing DOS memory and Graphics Winmark scores and a bottom-level DOS video mark. An asset in its favor, however, is an excellent 15-inch monitor, manufactured by Mitac.

ON READER SERVICE CARD

der both DOS and Windows—one of the best in this review group.

Performance scores other than video, however, were mixed. Although the processor score was average, the Mitac's poorly designed memory subsystem resulted in one of the lowest memory scores among the products tested. As is usual, the S3-based video subsystem performed poorly under DOS, while managing only slightly below-average Graphics Winmark scores—not good for a dedicated GUI accelerator.

A typical one-year parts-and-labor warranty covers this machine, and there is a Mitac toll-free technical support phone number.—OR

American Super Computer

American Super Computer

486X2/e66

American Super Computers offers the usual conglomeration of popular components combined to produce decent performance. Its 486DX2/e66, at \$3,569, is in our average price range for this group

FACT FILE

ALR Flyer 32DT 4DX2/66

Advanced Logic Research Inc., 9401
Jeronimo, Irvine, CA 92718; 800-444-4257,
714-581-6770; fax, 714-581-9240

List price (tested configuration): \$3,962.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 256K cache.

Disk drives and controller: Maxtor 7213AT 200MB IDE hard disk, integrated controller, 1.44MB floppy disk drive.

Display: Integrated Western Digital WD90C31 controller with 512K RAM; ALR FlexVIEW 3X 14-inch monitor with 72-Hz refresh rate at 800 by 600 resolution.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Advanced Logic Research's ALR Flyer 32DT 4DX2/66 offers several modular upgrade options, but the close confines of its slimline case and the availability of only three ISA expansion slots don't provide the unit with much room to grow. Its integrated video system was a weak performer on PC Magazine Labs' Graphics Winmark test routines, but it scored respectably in DOS video performance.

ON READER SERVICE CARD

The ECOSYS a-Si Printer for the business world.



A world of savings

We've just made your day! Because the new ECOSYS™ 10 page per minute amorphous silicon (aSi) printer costs less than a penny a page to run. An astonishing 68% less than those costly laser cartridge printers. Bank on it.

In fact, at less than a penny per page, ECOSYS features the lowest operating cost of any page printer, ever. (So low, it can make originals for less than the cost of a photocopy.) Compare that to 3.1¢ per page for cartridge printers.

The difference really adds up

A high volume network user can save over \$3,800 a year per printer. Just multiply that by the number of printers in your network. (Even a desktop user can save the entire price of a new printer in just a few years.)

Breakthrough after breakthrough

ECOSYS imaging technology has resulted in a print engine so long lasting that it will last over 75 times longer than a laser cartridge. Yet, amazingly, the ECOSYS takes up less than 1/2 the space of the LaserJet III®!

Its compact LED printhead with unique image resolution system allows up to 300x1200 dpi resolution. While ECOTONE™ microfine ceramic toner actually cleans, polishes and reconditions the print drum with every use.

ECOSYS offers an unprecedented range of upgradable features. Like two 500 sheet paper drawers, duplexing unit, 15-bin sorter/stacker/electronic mailbox and power envelope feeder. Offers unsurpassed compatibility too, with 6 standard emulations including PCL-5 and features like KPDL, Kyocera's optional PostScript compatible interpreter. Plus networking features like plug-in Token Ring, Ethernet and AppleTalk solutions.

That far reaching Kyocera warranty

Covering all parts and labor, Kyocera offers a 1 year or 300,000 page limited warranty on the total system. Plus a 3 year or 300,000 page limited warranty on the imaging system. Kyocera also offers ECOCARE™: Our affordable on-site service program, and the more comprehensive ECOCARE PLUS™: featuring on-site service support for 3 full years.

Kyocera even offers a money back compatibility guarantee assuring the performance of ECOSYS in your environment and application.

The unique advantage of ECOSYS Direct

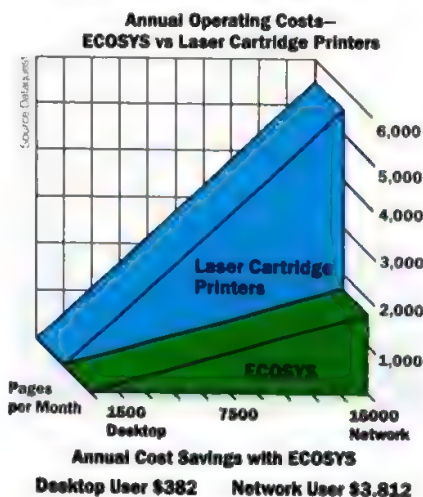
ECOSYS Direct is your direct line to Kyocera ... promising that your printing solutions receive Kyocera's direct attention. One more way that ECOSYS gives your dollars so much added value!

Call and ask for a free video or free demo disk describing the advantages of ECOSYS technology. See how ECOSYS can start saving for you and the environment.

800-2-ECOSYS
(800-232-6797)



**Saving the Earth
is the best investment
you can make.**



All trademarks referenced are trademarks or registered trademarks of their respective companies.
*This service is provided by guaranteed service providers and may not be available in certain geographic locations



Kyocera Electronics, Inc. 100 Randolph Road, Somerset NJ 08875

ECOSYS
a-Si PRINTER™

SUITABILITY TO TASK

American Super Computer 486X2/e66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

of 66-MHz 486-based power PCs.

Along with its impressive appearance, the standard-size tower excels in terms of upgradability. Had this been a lower processor platform, the processor plug-in card would have promised an easy upgrade. But, since for now there is no higher processor to move to, your options are limited. Furthermore, this same card has a mini-fan directly over the processor, which also prevents a full-length card from being seated nearby.

The ASC's virtue is simplicity; there are no technical extras, such as an easy-open case, flash upgradable BIOS, or integrated I/O ports. Everything is purposely standard-practice in order to reduce complexity and costs.

The ASC produced results that were average to slightly below average on

nearly all of our benchmark test routines. It yielded a surprisingly low processor score, while its memory numbers were exceptionally good. Its Quantum 240MB hard disk with internal 256K cache scored in the top half of the test group in the Windows disk test suite, but only in the



The American Super Computer 486X2/e66

middle of the pack in DOS disk performance.

The ATI Graphics Ultra video adapter with 1MB of video memory placed in the top half of the group on the Graphics Winmark test routines and received an average DOS video test score.

American Super Computers offers a two-year warranty with on-site service costing an extra \$268.—OR

Arche Technologies Inc.

Arche Legacy 486/66DX2

For such an average machine you would expect an average price. If that happens to be your expectation, you might not want to look here. The \$4,498 price tag on the Arche Legacy 486/66DX2 is hardly justifiable. At 128K, the processor RAM cache is smaller than that found in some other standard configurations; on



The Arche Legacy 486/66DX2

FACT FILE

Arche Legacy 486/66DX2

Arche Technologies Inc., 48502 Kato Rd.,
Fremont, CA 94538; 800-437-1688,
510-623-8100; fax, 510-683-6754

List price (tested configuration): \$4,498.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 128K cache.

Disk drives and controller: Western Digital Caviar 2200 16-ms 212MB IDE hard disk, Lion Technologies adapter, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond SpeedStar adapter with 1MB RAM and Tseng ET4000AX chip set, Arche PX214MH monitor, 48-Hz refresh rate at noninterlaced 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: For the price Arche charges for its 486/66DX2 machine, there isn't much here to speak of. Except for a good warranty, Arche hasn't included a whole lot. The system is made up of average parts, and its performance, based on PC Magazine Labs' benchmark tests, testifies to this.

ON-READER SERVICE CARD

the plus side, it is a direct write-back design. Its respectable Diamond SpeedStar video controller drives an unimpressive Arche monitor that can manage only a

*The ASC's virtue is
simplicity. Everything is
purposely standard
practice.*

48-Hz refresh rate at 1,024-by-768 resolution. Overall, the Arche's performance does not stand out either.

This machine's motherboard and chip set are both from Arche Technologies, so any problems you have should be answered with one phone call. One of the

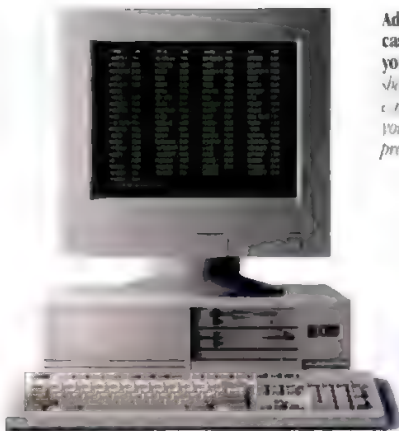
SUITABILITY TO TASK

Arche Legacy 486/66DX2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

If you're looking
for a computer
that will grow
with your needs,
there are basically
only two ways
you can go.

The hard way.



Add networking card, reconfigure your system. To share files and send e-mail to other PCs,



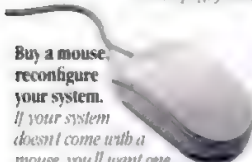
you may have to add a card. This means going through the tedious process of reconfiguring your system. On a Mac, you just plug in a cable.

Upgrade your memory, reconfigure your system. Add memory to a Mac, and it reconfigures itself accordingly. But add memory to a PC, and you'll almost always have to run a setup program to configure the new memory—or the computer won't know what to do with it.



Add almost anything, reconfigure your system. Expanding your PC's capabilities can be amazingly frustrating. But a Macintosh easily adjusts to whatever extra device you add to it.

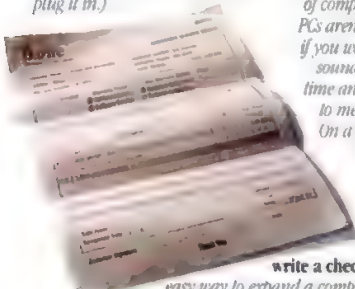
Add Windows, buy a new PC. Most PCs in use today weren't designed for graphical computing. So if you want to run Windows, you may have to buy a new computer. Why not consider a Macintosh and avoid all the problems on this page forever?



Buy a mouse, reconfigure your system. If your system doesn't come with a mouse, you'll want one. But first be prepared to install and configure a special software driver. (No need with a Mac—you just plug it in.)



Play and record sounds, reconfigure your system. Multimedia promises to be the future of computing. But most PCs aren't ready for it. So if you want to work with sound, it'll cost you time and trouble—not to mention money. On a Mac, sound is built in.

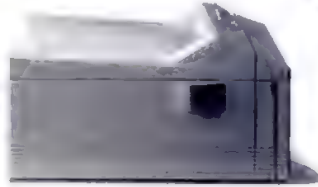


Call for help, write a check. There is one easy way to expand a complicated PC—hire somebody else to do it for you. Over time, of course, that can wind up costing you more than the PC.



Add peripherals, reconfigure your system for each one. Want to add a CD-ROM or hard disk drive? Then prepare to spend hours installing cards, slipping switches and editing files—for each one. With a Mac, you can add up to seven peripherals by simply plugging them in and clicking a button or two.

Add printer, adjust DIP switches. Hooking up a printer seems easy. Until you set your DIP switches, install your driver, locate your Windows diskettes, make an error and start all over again.

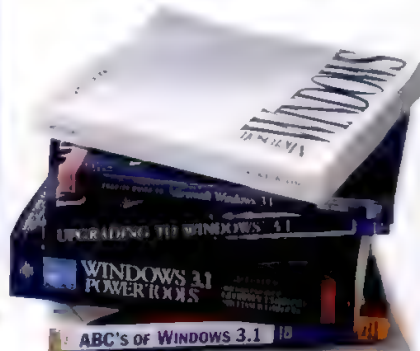


Expand your PC, take two aspirin. Inevitably, you'll want to expand your computer's capabilities by adding extra devices. The more instructions, switches, through and switches you fiddle with, the more time it will take and the more pain reliever you'll need.

Change monitors, reconfigure your system. Add a new monitor, and you'll have to reconfigure your entire system or your monitor could look like this one. A Mac recognizes a new monitor and adjusts to it automatically.



Whoops! When you add something to an ordinary PC, you may have to "reconfigure" your system—a process of hardware and software adjustments, which can be complex, tedious, and take up hours of your time.



Manual labor. Software like Windows purports to make things easier. But the reality is you will still spend hours reading manuals just to make it all work—time you could spend doing more useful things with your computer.

On a typical PC, even adding a simple hard disk can be extraordinarily complicated. You'll probably have to "reconfigure" your system—the time-consuming process of telling your computer what pieces you've added. You may have to edit complex CONFIG.SYS and SYSTEM.INI files, install special device drivers and fiddle with DIP switches. And, of course, building even a basic network is extremely difficult—what with installing

The easy way.

Macintosh is designed to make it easy to grow. Networking and sound support are already built in. File-sharing and multi-media capabilities are standard. So is support for up to seven peripherals. Which means you can add everything you see on the other page to this Macintosh line without using up a single expansion slot. Leaving room for things like an accelerator card, an Ethernet or Token-Ring card or other cards that allow you to customize a Mac for high performance or specialized tasks.



cards and networking software. An Apple Macintosh, on the other hand, knows when you've added a hard drive. Installing a CD-ROM drive or scanner is a matter of plugging in a cable and clicking a couple of buttons. Even installing a network requires nothing more than plugging one Mac into another. It's just one more example of how a Macintosh works in a simple, logical way. So you can, too.



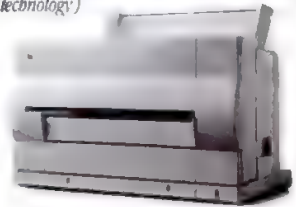
If you know how to use a plug, you know how to expand a Macintosh.



This Macintosh IIx has built-in monitor support for up to a 14" color monitor. Buy a card, and you can add a second monitor—significantly enlarging your desktop work area so you can move documents, files and folders across both screens.



Plug in an AppleCD™ 300 CD-ROM drive, and you'll have access to huge libraries of reference sources, fonts, clip art and video images on CD. (It even supports Kodak's exciting new Photo CD technology.)



A Mac gives you professional-quality documents even if you're on a student budget. Just plug in an Apple StyleWriter™ printer.



Plug in an Apple Personal LaserWriter™ NTR, and everyone in your workgroup will have access to the fastest printer in its class. (It works with PCs, too.)



You can easily record sound into every new Macintosh computer. Most even come with a microphone.

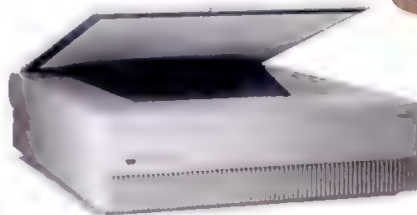
Plug in a SyQuest drive, and you'll have virtually unlimited hard drive storage via removable 44MB or 88MB cartridges.



Plug in an Apple LaserWriter IIg, and everyone on your network will instantly be able to take advantage of the Apple PhotoGrade™ technology that rivals 800 dpi printers costing thousands more—for spectacular-looking documents.



Plug in an external hard drive or other storage device, and you increase your storage capacity in seconds.



Plug in an Apple OneScanner™, and you can add beautiful black-and-white photographs to your documents with one touch of a button. No fussing or fiddling required.



Adding a peripheral to a Mac is as easy as using one. Plug it in, click a couple of buttons and get back to work.

For the second consecutive year, J.D. Power and Associates ranked Apple highest among Personal Computer Companies in Overall Customer Satisfaction.** And no wonder: whether you're writing a letter or adding a CD-ROM drive, only Macintosh makes things genuinely easy. Giving you the power you really want from a personal computer. The power to be your best.  Apple

For the name of your nearest authorized Apple reseller, call 1-800-538-9696, ext. 210. In Canada, call 1-800-565-2775, ext. 910. *Invoice prices are based on industry averages. **J.D. Power and Associates' 1991 and 1992 Computer End User Satisfaction Studies. 1992 study conducted among 2,255 business end users at 1,145 business sites. © 1992 Apple Computer, Inc. All rights reserved. Apple, the Apple logo, LaserWriter, Mac, Macintosh, StyleWriter and The power to be your best are registered trademarks of Apple Computer, Inc. AppleCD, OneScanner and PhotoGrade are trademarks of Apple Computer, Inc. Kodak and Photo CD are trademarks of Eastman Kodak Company. Windows is a trademark of Microsoft Corporation. SyQuest is a registered trademark of SyQuest Technology. This ad was created using Macintosh personal computers. LD366211A

hazards of having the power button located on the left-front part of the system is that wires inevitably criss-cross the motherboard. Arche has also placed the multi-I/O card with its IDE adapter in a middle slot causing additional wire traffic.

The SIMM banks, which can hold 32MB of RAM on the motherboard, are somewhat difficult to access beneath yet more wires. There is no heat sink on the CPU. Future expansion is somewhat limited by the inclusion of only two external 5.25-inch bays and one internal 3.5-inch bay.

When the parts come together, the Arche turns in its finest performance with its excellent DOS video scores, which rank among the top twenty percent of systems rated. Microsoft Windows graphics performance is not as impressive due to the Tseng chip set.

The warranty covers two years of parts, labor, and free on-site service from ISC-Bunker Ramo.—*Brad Grimes*

Ares Microdevelopment Inc.

Ares 486-66DX2 VL-Bus

The Ares 486-66DX2 VL-Bus is a fully loaded system that comes with many unexpected perks, such as a 2,400-bits-per-second internal modem and various handy software packages that you are likely to use. But most importantly, the Ares delivers consistently high-quality video, making it a good selection if you need both DOS and Microsoft Windows performance.

While the Micronics motherboard has two VESA-compatible local-bus slots, one of which Ares promises will be filled with local-bus video implementation

SUITABILITY TO TASK

Ares 486-66DX2 VL-Bus

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	●

soon, the company used the 24-bit Diamond SpeedStar 24X graphics adapter in this system. The visual package is rounded out by a 15-inch ViewSonic flat screen monitor. Windows video testing

showed it to be close behind our previous record holder, Compaq's QVision, although not nearly at the level of the Zeos 486DX2-66 system—our current champ. DOS video was significantly above average as well.

A nice addition was the use of a dual floppy disk drive that leaves four of the system's five drive bays free for future ex-

***Ares delivers consistently
high quality video,
making it a good
selection for both
DOS and Windows
performance.***

pansion. Meanwhile, DOS performance was nothing to scoff at, with all scores in the top third, except for disk performance, which fell to the back of the pack. Windows disk scores were above average.

An added bonus is the inclusion of

FACT FILE

Ares 486-66DX2 VL-Bus

*Ares Microdevelopment Inc., 23660-A
Research Dr., Farmington Hills, MI 48335;
800-322-3200, 313-473-0808;
fax, 313-473-4450*

List price (tested configuration): \$3,450.

Memory and processor: RAM cache: 8MB 70-ns. SIMMs, 256K cache.

Disk drives and controller: Quantum Pro 240AT LPS 15-ns 240MB IDE hard disk with 256K cache, adapter integrated on motherboard, dual 1.2MB and 1.44MB floppy disk drive.

Display: Diamond SpeedStar 24X adapter with 1MB RAM and Western Digital chip set, ViewSonic 8FS 15-inch flat-screen monitor, 72-Hz refresh rate at 1,024-by-768 noninterlaced.

Software: DOS 5.0, Microsoft Windows 3.1, Microsoft Works, QA Plus remote diagnostic software.

In short: The Ares comes loaded with many added bonuses, including a 2,400-bps internal modem and a substantial warranty. The Ares is a good system for those who work in both DOS and Windows.

ON READER SERVICE CARD



The Ares 486-66DX2 VL-Bus

QA Plus diagnostic software to help you troubleshoot any problems either over the phone or by modem. The generous warranty covers two years on the parts and a lifetime on labor. On-site service is free for one year from TRW and costs \$50 for the second year. Ares also pays all shipping costs, and technical support is available toll-free 24 hours a day, 7 days a week.—*BG*

Ariel Design Inc.

Ariel 486DX2-66VLB

The Ariel 486DX2-66VLB is an impressive tower system built around quality components and designed with expansion in mind. Despite an impressive showing on our benchmark tests, the machine has one major weak spot—its high price tag.

The Micronics motherboard is neat and well laid-out with no unruly wire traces or obstructed expansion slots, and it contains a built-in UltraStor disk controller. The use of a SCSI-2 interface will allow connection to six other devices including a DAT tape back-up, a CD-ROM drive, or a recordable optical drive,



The Ariel 486DX2-66VLB

Eliminate islands of automation.



Macola Accounting Software powers corporate connectivity.

Unproductive islands exist throughout your company... computerized departments that can't communicate.

Now they can. With Macola Software, you can bridge these communication gaps and seamlessly connect your PCs and your people. Imagine the benefits of linking these departments for shared operations, reporting and analysis:

Inventory	Accounting
Purchasing	Manufacturing
Shipping	Sales/Marketing
Maintenance	Engineering
Point-of-Sale	Executive Office
MIS/DP	Customer Service

Your productivity bridge.

Eliminating your islands of automation begins with Macola Accounting Software. Macola processes the information flow from all departments so you can get the right information to the right person at the right time. For all the details, call today.

1-800-468-0834

MACOLA
SOFTWARE

333 E. Center St. Marion, OH 43302-4148

Macola is a registered trademark of Macola, Inc. Copyright 1992.

CIRCLE 263 ON READER SERVICE CARD

COMPUTERS 486DX2/66s

SUMMARY OF FEATURES

486DX2/66 PCs

List price (PC Magazine configuration) For this review of 66-MHz 486DX2 computers, we requested a configuration that included 8MB of RAM, a 200MB hard disk, a Super VGA color display subsystem capable of at least 800-by-600 resolution with 256 simultaneous colors, one parallel and two serial ports, DOS 5.0, and Microsoft Windows 3.1.

Dealers/Direct-distribution channel Various machines are sold directly through mail order, through dealers, or, increasingly, through company-owned stores and superstores. Dealers have previously offered discounts of 25 percent or more off the list price; however, *PC Magazine* views a 15 percent discount as typical.

The **chip set manufacturer** makes the logic that connects the CPU with the other functions managed by the system board.

The **processor upgrade path** indicates whether the PC has a standard, ZIF (zero-insertion-force), or LIF (low-insertion-force) socket, or whether you must use a processor card to perform an upgrade.

The **BIOS version (or date)** can affect the system's performance on PC Magazine Labs' benchmark tests. A machine with another BIOS may perform differently.

Flash memory contains BIOS code that can be updated via software. The BIOS is generally stored in conventional ROM, which has no provision for modification.

Installable RAM indicates the amount of memory that can be installed using any combination of chips and proprietary cards.

Cache architecture A *four-way set-associative* cache, native to the 486's internal 8K cache, divides data into four equal blocks and is viewed as most effective. A *two-way set-associative* cache's data is split into two equal blocks, and the data in a *direct-mapped* cache (the most common and least costly) is not divided.

Cache write design A *write-back* design can cache data read from and written to memory. This method is theoretically superior to that of a *posted write-through* cache, which buffers all writes until

the memory system bus is free before completing them, and that of a *write-through* cache, in which only reads from memory are cached.

Accessible drive bays can be reached from the system's front panel and can support removable media (such as tape and CD-ROMs). **Internal drive bays** can be reached only by opening the case. We report the maximum number of accessible and internal drives the system can hold.

Floppy disk drives indicates the types of floppy disk drives the base-priced system contains. A *dual* floppy disk drive combines a 1.2MB and a 1.44MB unit inside a single drive bay.

Hard disk options We report the range of hard disk capacities the vendor offers for each system.

Disk controller location A computer with IDE (integrated drive electronics) circuitry has its controller functions integrated into the drive and motherboard but may have a separate controller.

Expansion bus For each type of expansion slot—8-bit, 16-bit, and 32-bit (EISA, MCA, or proprietary)—we report the number of slots on the motherboard. We also indicate how many parallel, serial, and mouse ports are integrated onto the motherboard.

The **display circuitry** can reside on an expansion card or on the PC's motherboard. Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it. We are also seeing an increasing number of video systems that rely on a local bus.

Other bundled software—beyond DOS and Windows—might include disk-caching software (such as SMARTDRV SYS), expanded-memory-management software (such as QEMM-386), and any other free applications. Our table indicates whether or not any software is included with each system, free of charge; for specifics, consult the fact file for the individual computer.

The **first-year on-site service charge** is sometimes included in the price of the system.

CONTINUES



UNITED HEALTHCARE

1. Tektronix Phaser 200 color printer \$3,695.00

✓ laser paper

✓ 2pp/min

✓ Adobe PS Level 2

APPROVED

Recommend dual-tray option \$3,695.00

X

Our new color printer not only looks great on paper, it looks great on paper.

True, the brilliant color produced by the new Tektronix Phaser® 200 is captivating. But the price is equally attractive. And though we've become the award-winning leader in color printers by frequently outdoing the competition, this time we've even outdone ourselves. Introducing our newest business work group color printer.



The eye when it sees black and white.



The eye when it sees color.

The Phaser 200 is compatible with virtually any business software and can print two colorful pages per minute. No, not two minutes per page—two pages per minute. And even at a speed like that, it still manages to print eye-catching color on common laser paper or transparencies using a separate input tray for each. You select the medium you want at your computer keyboard. And it switches automatically from user to user just as easily, using its parallel, serial, AppleTalk™, or optional EtherTalk™ and Ethernet™ ports.

It has all the advantages of a laser printer. True Adobe PostScript™ Level 2, networkability, Pantone® colors, speed and price. (Did you notice it's only \$3695, slightly below unheard of?) And when you add to that extremely high materials capacity and sparkling TekColor™ output—not just any color, but the indisputably best color in the business—you've got something even better than our previous best. Which is quite a feat.

So stop by your nearest Tektronix dealer or call us at 800/835-6100, Dept. 28E for a free output sample. For faxed information call 503/682-7450, ask for document #1223. You won't find another business investment that looks this good on paper.

Tektronix



COMPUTERS
486DX2/66s

► **S U M M A R Y O F F E A T U R E S**

486DX2/66 PCs

Products listed in alphabetical order

■ = YES □ = NO

	AcerPower 486e DX2/66 Model 5657	ALR Flyer 32DT 4DX2/66	American Mitac TL4466	American Super Computer 486X2/e66	Arche Legacy 486/66DX2	Ares 486-66DX2 VL-Bus	Ariel 486DX2-66VLB
List price (PC Magazine configuration)	\$3,599	\$3,962	\$3,499	\$3,569	\$4,498	\$3,450	\$4,295
Hard disk capacity	213MB	200MB	380MB	240MB	212MB	240MB	520MB
Dealers/Direct-distribution channel	■ □	■ ■	■ ■	■ ■	■ ■	■ □	□ ■
Case style	Desktop	Slimline	Tower	Tower	Small-footprint	Desktop	Tower
Bus architecture	EISA	ISA	EISA	EISA	ISA	ISA	ISA
Power supply (and number of connectors)	200 watts (4)	145 watts (4)	302 watts (5)	230 watts (6)	200 watts (4)	250 watts (5)	300 watts (4)

Motherboard and CPU

Motherboard manufacturer	Acer	ALR	American Mitac	BCM	Arche	Micronics	Micronics
Chip set manufacturer	OPTi	UMC	American Mitac/ Intel	Intel	Arche	Micronics	Micronics
Processor upgrade path	Standard socket	Processor card	Standard socket	Processor card	Standard socket	Standard socket	Standard socket
BIOS version (or date)	Acer 1.2R1.0	Phoenix 1.01 10m	Phoenix VEA4033 R1 04	AMI (5/3/91)	AMI 1.57	Phoenix (8/19/92)	Phoenix LB222
Flash memory	■	■	□	□	□	■	■
Weitek/Cyrix coprocessor socket	□	□	■	■	■	□	□

Memory and Processor RAM Cache

Installable RAM	4MB-256MB	4MB-36MB	1MB-64MB	4MB-64MB	4MB-32MB	4MB-64MB	4MB-64MB
External RAM cache	64K-256K	0-256K	1K-256K	64K-256K	128K	0-256K	0-256K
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Four-way set-associative	Direct-mapped	Direct-mapped	Direct-mapped
Cache write design	Write-back	Write-back	Write-back	Write-through	Write-back	Write-through	Write-through

Disk Drives

Accessible drive bays (5.25", 3.5")	3, 1	1, 1	7, 0	4, 1	2, 0	2, 1	5, 0
Internal drive bays (5.25", 3.5")	0, 1	1, 0	None	4, 0	1, 0	2, 0	2, 2
Floppy disk drives	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	Dual	1.2MB, 1.44MB
Hard disk options	120MB-500MB	80MB-535MB	80MB-380MB	105MB-544MB	80MB-650MB	127MB-1.2GB	212MB-2.1GB
Disk controller location	ISA card	Motherboard	EISA card	EISA card	ISA card	Motherboard	ISA card

Expansion Bus

8-bit/16-bit slots	0, 2	0, 3	0, 2	0, 1	1, 7	0, 8	0, 8
32-bit EISA/MCA/proprietary slots	5, 0, 1	0, 0, 3	6, 0, 0	6, 0, 1	None	None	None
Local-bus slots	1	None	None	None	None	2	2
Parallel, serial, mouse ports on motherboard	1, 2, 1	2, 1, 0	None	None	None	1, 2, 0	2, 1, 0
Integrated network adapter option	None	None	None	None	None	None	None

Video

Display circuitry location	Proprietary local bus	ISA card	EISA card	EISA card	ISA card	ISA card	VESA local bus
Video chip set manufacturer	ATI	WD	S3	ATI	Tseng	WD	ATI

Software

DOS 5.0/Microsoft Windows 3.1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Other bundled software	□	□	□	□	■	■	■

Miscellaneous

Warranty	1 year	1 year	1 year	2 years	2 years	2 years on parts, lifetime on labor	1 year
First-year on-site service charge	Included	\$9.95	\$99	\$268	Included	Included	\$50

N/A—Not applicable: The product does not have this feature. AIR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

COMPUTERS
486DX2/66s

AST Bravo 4/66d	ATronics ATI-486-66	Austin 486DX2 WinStation	Bi-Link Desktop i486DX2/66	BLK 486DX2/66	Blue Star 466D2U
\$4,205	\$3,495	\$2,990	\$2,665	\$2,995	\$2,949
340MB	340MB	220MB	210MB	213MB	340MB
Slimline	Small-footprint	Desktop	Tower	Mini-tower	Desktop
ISA	ISA	ISA	ISA	ISA	ISA
145 watts (4)	200 watts (4)	200 watts (5)	300 watts (6)	250 watts (5)	250 watts (4)

AST	ATronics	Micronics	AIR	AMI	ZEN
VLSI	UMC	Micronics	UMC	AMI	UMC
Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	Standard socket
AST 1 03	AMI (5/7/91)	Phoenix 0.10-g2-2-LB	AMI 27C512	AMI (12/12/91)	GA-30093 (4/4/92)

2MB-64MB	1MB-64MB	4MB-64MB	1MB-32MB	1MB-32MB	1MB-32MB
256K	32K-256K	64K-256K	64K-256K	64K-256K	128K-256K
Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped
Write-back	Write-back	Write-through	Write-back	Write-back	Write-back

2,0	3,2	3,0	5,0	2,2	2,1
2,0	None	0,2	2,1	0,1	2,0
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	Dual
120MB-520MB	80MB-2.4GB	40MB-1.2GB	120MB-530MB	40MB-22GB	106MB-1.2GB
Motherboard	ISA card	Motherboard	ISA card	Motherboard	ISA card

0,4	1,7	0,8	1,7	0,8	0,8
None	0,0,1	None	None	None	0,0,1
None	None	2	1	None	None
2,1,1	None	2,1,0	None	1,2,0	None
Ethernet	None	None	None	None	None

Motherboard	ISA card	VESA local bus	Proprietary local bus	ISA card	ISA card
Cirrus	S3	ATI	S3	Tseng	WD

1 year	1 year	1 year	1 year	1 year	1 year
Included	\$99	Included	N/A	Included	\$59

CONTINUES

and its coupling in this system with a 520MB Fujitsu SCSI-2 hard disk and a 240K cache produced the expected disk performance dividends. The Ariel system was comfortably in the middle of the pack

SUITABILITY TO TASK

Ariel 486DX2-66VLB

	POOR	FAIR	GOOD	EXCELLENT
DOS applications				
Windows applications				
Expandability				

or better in terms of both DOS disk speed and Windows disk simulation. In addition, the Ariel does offer larger hard disks for serious data hounds: a \$400 1GB Maxtor unit or a 2.1GB Micropolis hard disk.

The Ariel's performance was nothing short of impressive: The system scorched the DOS video test routines and was in the top ten on Windows graphics performance. The system's ATI video card can be improved by upgrading it to hold 2MB of RAM for \$130. The system comes with an excellent NEC 15-inch flat-screen monitor.

In addition to a plethora of useful soft-

FACT FILE

Ariel 486DX2-66VLB

*Ariel Design Inc., 145 Webster St., Hanover,
MA 02339; 800-622-7435; 617-982-8800;
fax, 617-982-9095*

List price (tested configuration): \$4,295.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 256K external cache.

Disk drives and controller: Fujitsu M2624FA 12-ms 520MB SCSI-2 hard disk with 240K cache, UltraStor adapter integrated on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Graphics UltraPro/Mach 32 local-bus video with 1MB RAM, 15-inch monitor, 70-Hz refresh rate at 1,024 by 768.

Software: DOS 5.0, Microsoft Windows 3.1, choice of Paradox 4.0, Quattro Pro, Quattro Pro for Windows, or Turbo C++.

In short: The Ariel 486DX2-66VLB is first and foremost a highly expandable system that is built around quality components. With impressive performance test results, this is a system that justifies its high price tag.

514 ON READER SERVICE CARD

COMPUTERS
486DX2/66s

► **S U M M A R Y O F F E A T U R E S**

Products listed in alphabetical order

■ = YES □ = NO

	BOSS 466d	Broadax 486DX2-66	C² Saber 486/e DX2-66	CAF Gold 6D2	Clover 486 Quick-I Series	Comex 486DX2/66	Compaq Deskpro 66M	
List price (PC Magazine configuration)	\$4,495	\$2,260	\$4,145	\$2,459	\$3,459	\$2,750	\$5,192	
Hard disk capacity	245MB	212MB	358MB	213MB	245MB	202MB	211MB	
Dealers/Direct-distribution channel	■ □	■ ■	■ □	■ □	□ ■	■ □	■ □	
Case style	Mini-tower	Desktop	Tower	Desktop	Small-footprint	Desktop	Desktop	
Bus architecture	ISA	ISA	EISA	ISA	ISA	ISA	EISA	
Power supply (and number of connectors)	300 watts (6)	200 watts (5)	250 watts (6)	200 watts (5)	200 watts (4)	250 watts (5)	240 watts (4)	
Motherboard and CPU								
Motherboard manufacturer	AMI	TMC	BCM	CAF	Quickpath	Micronics	Compaq	
Chip set manufacturer	AMI	OPTi	Intel	SIS	OPTi	C&T/Micronics	Intel	
Processor upgrade path	Standard socket	Standard socket	Processor card	Standard socket	ZIF socket	Standard socket	Processor card	
BIOS version (or date)	AMI (12/12/91)	AMI (6/06/91)	AMI (4/21/92)	AMI 1.02	AMI (6/1/91)	Phoenix 0.10 g20-2	Compaq 66/M (6/22/92)	
Flash memory	□	□	□	□	□	□	□	
Weitek/Cyrix coprocessor socket	■	□	□	■	■	■	■	
Memory and Processor RAM Cache								
Installable RAM	1MB-32MB	1MB-32MB	1MB-64MB	1MB-32MB	512K-32MB	1MB-32MB	8MB-64MB	
External RAM cache	64K-256K	64K-256K	64K-256K	64K-256K	0-256K	64K-256K	256K	
Cache architecture	Four-way set-associative	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Four-way set-associative	
Cache write design	Write-back	Write-back	Write-through	Write-back	Write-back	Write-through	Write-back	
Disk Drives								
Accessible drive bays (5.25", 3.5")	3, 2	3, 0	4, 1	3, 2	3, 0	2, 1	3, 0	
Internal drive bays (5.25", 3.5")	1, 0	0, 2	4, 0	0, 2	0, 4	1, 1	0, 1	
Floppy disk drives	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	
Hard disk options	106MB-535MB	40MB-1.5GB	42MB-2GB	40MB-200MB	120MB-1.2GB	30MB-670MB	84MB-510MB	
Disk controller location	ISA card	ISA card	EISA card	ISA card	ISA card	ISA card	Motherboard	
Expansion Bus								
8-bit/16-bit slots	1, 7	2, 6	0, 1	0, 8	0, 8	0, 8	None	
32-bit EISA/MCA/proprietary slots	None	None	6, 0, 0	None	None	1, 0, 0	5, 0, 2	
Local-bus slots	None	None	None	None	None	None	None	
Parallel, serial, mouse ports on motherboard	1, 2, 0	None	None	None	None	None	1, 2, 1	
Integrated network adapter option	None	None	None	None	None	None	None	
Video								
Display circuitry location	ISA card	ISA card	ISA card	Motherboard	ISA card	ISA card	EISA card	
Video chip set manufacturer	WD	ATI	WD	WD	S3	ATI	Compaq	
Software								
DOS 5.0/Microsoft Windows 3.1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	
Other bundled software	□	□	□	□	□	□	■	
Miscellaneous								
Warranty	2 years	1 year	1 year	1 year	1 year	2 years	1 year	
First-year on-site service charge	Included	\$80	\$75	None	Included	Included	Included	

N/A—Not applicable: The product does not have this feature. AIR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

CompuAdd 466E	CompuAdd Express 466DX2 Scalable	Comtrade 486 EISA Dream Machine	Dell 466DE/2	DFI 486-66DX2	Diamond DX2-66
\$4,213	\$2,675	\$3,095	\$4,069	\$3,982	\$2,995
212MB	200MB	212MB	230MB	202MB	245MB
■ ■	□ ■	■ ■	■ ■	■ □	□ ■
Desktop	Slimline	Tower	Small-footprint	Tower	Tower
EISA	ISA	EISA	EISA	ISA	EISA
200 watts (5)	150 watts (5)	230 watts (5)	224 watts (4)	250 watts (5)	200 watts (4)

CompuAdd	CompuAdd	ECS	Dell	DFI	S&A Lab
Intel	OPTi	SIS	Dell	UMC	OPTi
Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	Standard socket
Phoenix 1.01	AMI/OPTi DXBB-F	AMI (12/12/91)	Phoenix/Dell (A06)	AMI (7/07/91)	AMI (7/7/91)
□	□	□	■	□	□
■	□	□	□	□	■

4MB-64MB	1MB-32MB	1MB-128MB	4MB-96MB	1MB-32MB	1MB-128MB
256K	128K	64K-256K	128K	32K-256K	64K-512K
Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped
Write-back	Write-back	Write-back	Write-through	Write-back	Write-back

2, 1	1, 1	3, 3	3, 0	4, 0	3, 2
0, 4	0, 1	0, 2	0, 1	2, 0	0, 2
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB
80MB-500MB	80MB-340MB	130MB-510MB	80MB-1.4GB	200MB-675MB	80MB-1.2GB
EISA card	Motherboard	EISA card	Motherboard	ISA card	EISA card

None	2, 3	None	None	0, 7	None
8, 0, 0	None	7, 0, 0	6, 0, 0	0, 0, 1	8, 0, 0
None	None	1	None	2	None
None	1, 2, 0	None	2, 1, 1	None	None
None	None	None	None	None	None

EISA card	Motherboard	ISA card	ISA card	UBSA local bus	ISA card
WD	Tseng	WD	ATI	Tseng	ATI

■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
□	□	□	□	□	□

1 year	1 year	2 years on parts, lifetime on labor	1 year	1 year	15 months on parts, 2 years on labor
Included	Included	Included	Included	Included	\$75

CONTINUES

ware, Ariel offers a one-year warranty and a 30-day money back guarantee. On-site service is available for \$50 a year from a third party.

Toll-free support is available Monday through Saturday for the life of the system as well as through Ariel's bulletin board service.—BG

AST Research Inc.

AST Bravo 4/66d

The AST Bravo 4/66d is a well-integrated and easily expandable system that shows the costs and benefits of a one-company approach to components. With the motherboard, BIOS, monitor, and integrated video coming from AST Research, the one-stop shopping approach makes for a neat and orderly layout. However, the \$4,205 price seems steep. The supposed savings from relying on the AST parts bin haven't trickled down to consumers just yet. AST also offers two other DX2/66 systems under the higher-priced Advantage and Power Premium brands.

Performance was average or above on most of our benchmark tests, but the Bravo 4/66d's Graphics Winmark score

► FACT FILE

AST Bravo 4/66d

AST Research Inc., 16215 Alton Pkwy., Irvine, CA 92713-9658; 800-876-4278, 714-727-4141; fax, 714-727-9355

List price (tested configuration): \$4,205.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 256K cache.

Disk drives and controller: Maxtor LXT340A 13-ms 340MB IDE hard disk, adapter integrated on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: Adapter integrated on the motherboard with 1MB RAM and Cirrus Logic chip set, AST SVGA-LR 14-inch monitor, 70-Hz refresh rate at 1,024 by 768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The AST Bravo 4/66d integrates a lot of AST's standard components onto its motherboard. This system excels in its upgradability, and it provides an efficient upgrade path. Although the system's price may seem high even after discounts, AST has not skimped on features.



Try One On
For Size!



You can't fully appreciate the amazing little HandBook™ from Gateway 2000 until you've tried one on for size!

Notice the HandBook's keyboard printed here. We've tailored it for comfortable touch typing, even though the HandBook measures less than 6 x 10 inches.

Look at the backlit screen. It's bright, easy to read and easy on your eyes in any setting, with any lighting.

Imagine the HandBook tucked in your briefcase. It leaves plenty of room for important papers, and it weighs just 2.75 pounds, including battery!

Now imagine it seamlessly running all your DOS applications with 286-class performance, and 4.5 hours battery life with power management.

We've sewed up the HandBook with plenty of hard-working PC features, and added a convenient Auto Resume: when you pause in your work, just close the cover to put the HandBook to "sleep." Open the cover and it automatically resumes wherever you left off. No need to close files, quit applications and shut down the system—then open everything up again. Conserve battery power and time!

The HandBook is a one-of-a-kind portable PC—a true designer original that's causing real excitement in the PC industry. In fact, Popular Science recently named the HandBook one of the year's top 100 "Best of What's New" achievements!

Do we have you on pins and needles? Then call Gateway 2000 today to try one on for size. It's definitely dressing for success!

\$1295

HandBook options include 2400 bps data/9600 bps send-and-receive fax modem, portable printer, extra AC adapter, extra 2.3Ah battery, RAM upgrade to 3MB, combo unit (1.44MB external floppy drive with one parallel and one serial port) and extended VIP warranty.



800-523-2000

610 Gateway Drive • P.O. Box 2000 • North Sioux City, SD 57049-2000

©1992 Gateway 2000, Inc. HandBook and FieldMouse are trademarks of Gateway 2000, Inc. All other brands and product names are trademarks of their respective companies. Prices and configurations are subject to change without notice. Prices do not include shipping.

COMPUTERS

486DX2/66s

► SUMMARY OF FEATURES

								
Products listed in alphabetical order	Digital DECpc 466d2 LP	Edge 466 Magnum	EPS ISA 486 DX2/66	Everex Tempo M Series 486 DX2/66	Expo 486 dX2/66	FCS 486-66	FutureTech System 462E	
■ = YES □ = NO								
List price (PC Magazine configuration)	\$3,124	\$3,499	\$2,945	\$4,563	\$2,799	\$3,999	\$4,529	
Hard disk capacity	240MB	213MB	340MB	244MB	245MB	330MB	425MB	
Dealers/Direct-distribution channel	■ ■	□ ■	□ ■	■ □	□ ■	■ ■	■ ■	
Case style	Slimline	Slimline	Small-footprint	Desktop	Tower	Tower	Tower	
Bus architecture	ISA	EISA	ISA	ISA	ISA	ISA	EISA	
Power supply (and number of connectors)	146 watts (4)	200 watts (5)	200 watts (5)	200 watts (4)	300 watts (5)	300 watts (6)	300 watts (6)	
Motherboard and CPU								
Motherboard manufacturer	Digital	ECS	Contaq	Everex	VTech	MCCI	Mylex	
Chip set manufacturer	C&T/OPTi	SIS	Contaq	Everex	VTech	OPTi	Intel	
Processor upgrade path	Processor card	Standard socket	Standard socket	Processor card	Standard socket	Standard socket	Standard socket	
BIOS version (or date)	Phoenix 1.01.02	AMI 1.0	AMI (6/12/92)	AMI 011589-K0	AMI (8/5/92)	AMI (7/7/91)	Mylex 6.15	
Flash memory	■	□	□	□	□	□	□	
Weitek/Cyrix coprocessor socket	□	■	■	□	■	■	□	
Memory and Processor RAM Cache								
Installable RAM	4MB-64MB	1MB-128MB	1MB-32MB	1MB-32MB	4MB-64MB	1MB-32MB	4MB-32MB	
External RAM cache	128K-256K	64K-256K	64K-256K	128K-256K	0-256K	256K	128K-256K	
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Four-way set-associative	Direct-mapped	Direct-mapped	
Cache write design	Write-back	Write-back	Write-back	Write-back	Write-back	Write-back	Write-back	
Disk Drives								
Accessible drive bays (5.25", 3.5")	0, 2	3, 0	2, 1	3, 0	6, 0	3, 0	6, 0	
Internal drive bays (5.25", 3.5")	0, 2	0, 2	2, 0	2, 0	2, 0	2, 0	3, 0	
Floppy disk drives	1.44MB	Dual	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	
Hard disk options	52MB-426MB	213MB-1.2GB	80MB-1.2GB	40MB-1GB	245MB-426MB	200MB-2GB	120MB-2.4GB	
Disk controller location	Motherboard	EISA card	ISA card	Motherboard	ISA card	ISA card	EISA card	
Expansion Bus								
8-bit/16-bit slots	0, 3	0, 7	2, 6	1, 6	2, 8	0, 7	None	
32-bit EISA/MCA/proprietary slots	None	None	None	0, 0, 1	None	None	8, 0, 0	
Local-bus slots	None	1	None	None	None	None	None	
Parallel, serial, mouse ports on motherboard	1, 2, 1	None	None	1, 2, 0	None	None	None	
Integrated network adapter option	None	None	None	None	None	None	None	
Video								
Display circuitry location	Proprietary local bus	Proprietary local bus	ISA card	Motherboard	ISA card	Motherboard	ISA card	
Video chip set manufacturer	S3	S3	ATI	Tseng	ATI	S3	ATI	
Software								
DOS 5.0/Microsoft Windows 3.1	■ ■	■ □	■ ■	■ ■	■ ■	■ ■	■ ■	
Other bundled software	□	□	□	□	■	□	□	
Miscellaneous								
Warranty	1 year	1 year	3 years	1 year	1 year	1 year on parts, 2 years on labor	15 months	
First-year on-site service charge	Included	Included	Included	Included	Included	Info not available	\$79	

N/A—Not applicable: The product does not have this feature. AIR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

COMPUTERS
486DX2/66s

SUITABILITY TO TASK

AST Bravo 4/66d

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

lagged behind the other DX2/66 systems. The Cirrus Logic chip set handled DOS-based displays better than the rigors of Windows. The system's top-of-the-line AST 14-inch monitor performed adequately.

Expansion is where the Bravo 4/66d excelled. The motherboard can handle up to 64MB of SIMMs at \$130 per 2MB upgrade; the processor is located on a daughterboard that snaps into the motherboard making for an easy upgrade path. Integrated disk and video adapters



The AST Bravo 4/66d

leave four 16-bit ISA slots open and easily accessible. Drive expansion consists of two front-accessible and two internal 5.25-inch bays and a 520MB drive is available from AST for an extra \$250.

The one-year warranty on parts and labor is backed by authorized AST dealers and service centers. On-site service is available for certain models through dealers. AST provides toll-free technical support Monday through Saturday as well as via a bulletin board.—BG

ATronics International Inc.

ATronics ATI-486-66

The first thing you notice about the \$3,495 Atronic ATI-486-66 is the removable hard disk bay with its protruding handle, which could come in handy. The drive's 4MB caching controller makes the

PC EDITORS' CHOICE	Gateway 2000 4DX2-66V	GCH EasyData 486DX-2/66	Gecco 466E	HP Vectra 486/66U	Hyundai 466D2	IBM PS/2 Model 77 486DX2
	\$2,995	\$3,860	\$3,225	\$4,545	\$2,721	\$5,415
	340MB	340MB	240MB	245MB	212MB	400MB
	□ ■	■ □	□ ■	■ □	■ ■	■ □
	Desktop	Small-footprint	Tower	Desktop	Small-footprint	Desktop
	ISA	ISA	EISA	EISA	ISA	MCA
	200 watts (5)	220 watts (4)	250 watts (5)	228 watts (5)	200 watts (6)	200 watts (4)

Micronics	GSS	Kouwell	HP	Hyundai	IBM
Micronics	SIS	SIS	HP/TI	OPTi	IBM
Standard socket	Standard socket	Standard socket	LIF socket	ZIF socket	Standard socket
Phoenix 1.10	AMI (12/12/91)	AMI (4/1/92)	HP/Phoenix P.04.03	AMI (6/6/92)	IBM 3G6921
■	□	□	■	□	□
□	□	■	□	□	□

4MB-64MB	1MB-32MB	1MB-128MB	4MB-64MB	1MB-64MB	2MB-32MB
64K-256K	64K-256K	64K-128K	128K	128K-256K	None
Two-way set-associative	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped	N/A
Write-through	Write-back	Write-back	Posted write-through	Write-back	N/A

3, 2	3, 1	4, 0	2, 1	3, 2	3, 1
2, 0	0, 1	1, 3	None	0, 2	None
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	1.2MB, 1.44MB	2.88MB
80MB-1.2GB	80MB-1.2GB	330MB-1GB	240MB-430MB	80MB-540MB	212MB-400MB
Motherboard	EISA card	EISA card	Motherboard	Motherboard	Motherboard

0, 6	1, 6	0, 2	None	0, 6	None
None	None	6, 0, 0	5, 0, 0	None	0, 5, 0
2	None	None	None	1	None
2, 1, 0	None	None	1, 2, 1	1, 2, 1	1, 2, 1
None	None	None	None	None	None

Motherboard	EISA card	EISA card	Motherboard	VESA local bus	MCA card
ATI	S3	Tseng	S3	ATI	IBM

■ ■	■ ■	■ ■	■ ■	■ ■	□ □
■	■	□	□	□	■

1 year	1 year	2 years	1 year	18 months	3 years
Included	\$99	Included	Included	Included	Included

CONTINUES

COMPUTERS
486DX2/66s

► **S U M M A R Y O F F E A T U R E S**

Products listed in alphabetical order	IDS 466i2	Insight 486DX2-66i	Int. Instr. Blue Max Monolith 486D2/66UP	Keydata 486DX2-66 KeyStation	Lightning ThunderBox	LodeStar 486-DX2/66 EISA WINstation	Mega Impact 486DX2/66E+	
■ = YES □ = NO								
List price (PC Magazine configuration)	\$2,949	\$2,999	\$2,797	\$3,195	\$3,395	\$3,199	\$3,650	
Hard disk capacity	362MB	490MB	213MB	345MB	363MB	213MB	340MB	
Dealers/Direct-distribution channel	□ ■	□ ■	■ ■	□ ■	■ ■	■ ■	■ ■	
Case style	Small-footprint	Desktop	Desktop	Tower	Desktop	Tower	Tower	
Bus architecture	ISA	ISA	ISA	EISA	ISA	EISA	EISA	
Power supply (and number of connectors)	200 watts (5)	200 watts (4)	250 watts (7)	250 watts (4)	250 watts (6)	250 watts (6)	250 watts (5)	

Motherboard and CPU

Motherboard manufacturer	AMI	Aten	Int. Instr.	Asus	Micronics	Giga	BCM	
Chip set manufacturer	C&T	OPTi	SIS/UNI Chip	SIS	C&T	OPTi	Intel	
Processor upgrade path	Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	Processor card	
BIOS version (or date)	AMI 486 (12/12/91)	AMI 4.01	AMI (12/12/91)	Award 1.0	Phoenix 1.01	AMI (9/1/92)	AMI 1.01	
Flash memory	■	□	□	□	■	□	□	
Weitek/Cyrix coprocessor socket	■	■	□	■	□	■	□	

Memory and Processor RAM Cache

Installable RAM	1MB-32MB	1MB-32MB	1MB-128MB	1MB-128MB	4MB-16MB	1MB-32MB	1MB-64MB	
External RAM cache	64K-256K	64K-256K	64K-256K	64K-256K	256K	64K-512K	64K-256K	
Cache architecture	Direct-mapped	Four-way set-associative	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	
Cache write design	Write-back	Write-back	Write-through	Write-through	Write-through	Write-back	Write-through	

Disk Drives

Accessible drive bays (5.25", 3.5")	3, 0	3, 1	4, 0	5, 2	2, 2	4, 2	4, 0	
Internal drive bays (5.25", 3.5")	0, 2	0, 1	2, 0	0, 1	0, 2	2, 3	1, 3	
Floppy disk drives	Dual	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	
Hard disk options	80MB-2GB	40MB-2.1GB	43MB-2.2GB	240MB-600MB	100MB-5.6GB	40MB-4GB	210MB-2GB	
Disk controller location	Motherboard	ISA card	ISA card	EISA card	ISA card	ISA card	EISA card	

Expansion Bus

8-bit/16-bit slots	1, 7	1, 7	2, 5	None	0, 6	0, 2	0, 1	
32-bit EISA/MCA/proprietary slots	None	None	0, 0, 1	8, 0, 0	None	6, 0, 0	6, 0, 1	
Local-bus slots	None	None	None	None	2	None	None	
Parallel, serial, mouse ports on motherboard	1, 2, 0	None	1, 2, 0	None	1, 2, 0	None	None	
Integrated network adapter option	None	None	None	None	None	None	None	

Video

Display circuitry location	ISA card	ISA card	Local bus	ISA card	VESA local bus	ISA card	ISA card	
Video chip set manufacturer	ATI	Cirrus	ATI/Tseng	NCR	ATI	S3	ATI	

Software

DOS 5.0/Microsoft Windows 3.1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	
Other bundled software	□	■	□	□	□	□	□	

Miscellaneous

Warranty	1 year	1 year	1 year	18 months	2 years	2 years on parts, lifetime on labor	1 year	
First-year on-site service charge	\$95	N/A	Included	Included	\$75	Included	N/A	

N/A—Not applicable: The product does not have this feature. AIR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

COMPUTERS
486DX2/66s

Memorex Telex 8092-66	Micro Express ME 486-Local Bus/DX2/66	Naga Windows Workstation	National Microsystems Flash 486DX2-66E	NCR System 3350	NEC Express DX2/66e
\$4,665	\$3,599	\$3,195	\$3,999	\$4,600	\$4,599
213MB	240MB	340MB	312MB	340MB	535MB
☐ ☒	☐ ☒	☐ ☒	☐ ☒	☒ ☒	☒ ☐
Small-footprint	Mini-tower	Desktop	Tower	Small-footprint	Desktop
ISA	ISA	ISA	EISA	MCA	EISA
230 watts (5)	200 watts (5)	200 watts (4)	300 watts (5)	182 watts (4)	285 watts (6)

Cache Computers	Ergon	Asus	AIR	NCR	NEC
UMC	OPTi	SIS	OPTi	CSI Logic/Intel/ NCR/VLSI	Intel
Standard socket	ZIF socket	Standard socket	Standard socket	Processor card	Processor card
AMI (12/12/91)	Phoenix/ATI BIOS (8/12/92)	AMI (5/5/91)	AMI (12/12/91)	Phoenix 1.00.12	Phoenix 1.00.40
☐ ☒	☒ ☐	☐ ☒	☐ ☒	☐ ☐	☒ ☐

1MB-32MB	4MB-32MB	1MB-64MB	1MB-128MB	2MB-192MB	4MB-256MB
0-256K	256K	128K-256K	64K-512K	64K-128K	128K
Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Two-way set-associative	Four-way set-associative
Write-back	Write-back	Write-through	Write-back	Write-through	Write-back

3, 0	3, 2	3, 2	5, 0	1, 1	2, 1
0, 1	1, 0	None	2, 3	0, 2	2, 0
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB	1.44MB
80MB-520MB	80MB-1.5GB	40MB-1.7GB	40MB-1.7GB	120MB-1GB	240MB-1.5GB
Motherboard	ISA card	ISA card	EISA card	Motherboard	Motherboard

0, 7	0, 7	1, 8	None	None	None
0, 0, 1	None	0, 0, 1	7, 0, 0	0, 4, 2	5, 0, 1
None	None	None	1	None	None
1, 2, 0	1, 1, 0	None	None	1, 1, 1	1, 2, 0
None	None	None	None	None	None

ISA card	Local bus	ISA card	Local bus	Motherboard	Motherboard
ATI	Tseng	Tseng	S3	NCR	Tseng

☐ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒
☐	☐	☒	☐	☐	☐

1 year	2 years	2 years on parts, lifetime on labor	15 months on parts, 2 years on labor	2 years	1 year
Included	\$50	Included	\$50	Included	Included

CONTINUES

SUITABILITY TO TASK

ATronics ATI-486-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	☒	☒	☒	☒
Windows applications	☒	☒	☒	☐
Expandability	☒	☒	☒	☐

340MB Maxtor drive run exceptionally fast under DOS. However, some other components in this sturdy, small-footprint desktop system give disappointing



performance.

The ATronics motherboard can hold 32MB of RAM plus an additional 32MB

FACT FILE

ATronics ATI-486-66

*ATronics International Inc., 45635
Northport Loop East, Fremont, CA 94538-
6415; 800-488-7776, 510-656-8400;
fax, 510-656-8560*

List price (tested configuration): \$3,495.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 256K cache.

Disk drives and controller: Maxtor 13-ms. 340MB IDE hard disk with 32K buffer, ATI-DC100 adapter with 4MB cache, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond Stealth VRAM adapter with 1MB RAM and S3 video chip set, CTX CPS-1560 ProScan 15-inch monitor with 60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Featuring stellar performance on PC Magazine Labs' DOS disk test routines and competitive results on other tests, a front-removable hard disk, and a state-of-the-art CTX ProScan monitor, ATronics International's ATI-486-66 system provides a very loaded package at a very competitive price.

ON READER SERVICE CARD

{ New }



Up to 86% more disk capacity.
You get up to 3 gigabytes of disk capacity. It's only your garage had this much storage space.



33% more slots.
With 8 slots, you can add the network, communication and multiport cards you need for a great low-cost server.



i486 DX 33 MHz
\$2,799
LEASE[®]: \$104/MO.

Better computers for
less money.

It's what's made us a \$1.3 billion
FORTUNE 500[®] company.

**THE NEW DELL 433/T
i486 DX 33 MHz SYSTEM
\$2,799**

- LEASE: \$104/MO.
- 4 MB RAM
- 230 MB (16 ms) HARD DRIVE
- 8 ISA EXPANSION SLOTS
- UPGRADEABLE PROCESSOR
- ACCELERATED LOCAL BUS VIDEO
WITH 1 MB VIDEO RAM
(UP TO 19 MILLION WINMARKS)
- ULTRASCAN[™] 14C MONITOR
(14", 1024 X 768, .28mm, NII)
- ONE FLOPPY DRIVE (3.5" OR 5.25")
- MS-DOS[®] 5.0

ALSO AVAILABLE IN 50 MHz AND 66 MHz i486 DX2
AND THOUSANDS OF OTHER CONFIGURATIONS.



Greater upgradeability.

You can upgrade
all the way to the top 486, the 66
MHz DX2. After that, you'll be
able to add the Pentium[™]
microprocessor —
the next generation from Intel.

**Up to 168%
faster video.**

With our new
accelerated local bus
video revving up
your screen, who
needs a VCR?

IT HAS ENOUGH UPGRADEABILITY TO OUTLAST PASSING FADS.

OUR COMPETITORS, FOR INSTANCE.

DELL

800-388-1720

WHEN CALLING, PLEASE REFERENCE #118CD.

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.
IN CANADA, CALL 800-668-3021. IN MEXICO CITY, 228-7811.

COMPUTERS
486DX2/66s

► **S U M M A R Y O F F E A T U R E S**

Products listed in alphabetical order								
■ = YES □ = NO	NETiS Ultra WinStation N466L	Northgate SlimLine ZXP	Occidental 66MHz 486DX2	Osicom i466 MOD 420	PC Brand Leader Cache 486/DX2-66	PC Pros 486/66DX2 5550T	PCS Double Pro-66	
List price (PC Magazine configuration)	\$2,300	\$3,197	\$2,895	\$3,795	\$2,545	\$2,999	\$3,895	
Hard disk capacity	213MB	245MB	245MB	420MB	170MB	340MB	245MB	
Dealers/Direct-distribution channel	■ ■	□ ■	□ ■	■ ■	□ ■	□ ■	□ ■	
Case style	Desktop	Slimline	Tower	Small-footprint	Desktop	Tower	Desktop	
Bus architecture	ISA	ISA	ISA	ISA	ISA	ISA	ISA	
Power supply (and number of connectors)	200 watts (5)	150 watts (3)	200 watts (7)	200 watts (5)	200 watts (5)	300 watts (4)	200 watts (4)	
Motherboard and CPU								
Motherboard manufacturer	NETiS	Northgate	Occidental	Osicom	PC Brand	AMI	AMI	
Chip set manufacturer	Unichip	Headland	VLSI	OPTi	Symphony	C&T	AMI Series 50	
Processor upgrade path	Standard socket	ZIF socket	ZIF socket	Standard socket	Standard socket	Standard socket	Standard socket	
BIOS version (or date)	AMI (12/12/91)	Northgate 9.01	AMI 1.04	AMI (6/6/91)	PC Brand 3.86	AMI 1.2	AMI (12/12/91)	
Flash memory	□	□	■	□	□	■	□	
Weitek/Cyrix coprocessor socket	□	□	□	■	■	□	□	
Memory and Processor RAM Cache								
Installable RAM	1MB-128MB	4MB-128MB	1MB-32MB	1MB-32MB	1MB-32MB	1MB-32MB	1MB-32MB	
External RAM cache	64K-256K	None	128K-256K	64K-256K	64K-256K	64K-256K	64K-256K	
Cache architecture	Four-way set-associative	N/A	N/A	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	
Cache write design	Write-back	N/A	N/A	Write-back	Write-through	Write-back	Write-back	
Disk Drives								
Accessible drive bays (5.25", 3.5")	1, 1	1, 1	4, 0	3, 1	2, 2	6, 0	3, 1	
Internal drive bays (5.25", 3.5")	0, 1	1, 0	2, 4	0, 1	None	0, 3	None	
Floppy disk drives	1.2MB, 1.44MB	Dual	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	
Hard disk options	42MB-520MB	100MB-340MB	170MB-1.2GB	100MB-1.5GB	105MB-400MB	207MB-1.35GB	80MB-425MB	
Disk controller location	ISA card	Motherboard	Motherboard	ISA card	Motherboard	ISA card	Motherboard	
Expansion Bus								
8-bit/16-bit slots	2, 5	2, 3	1, 7	2, 6	1, 4	1, 7	1, 7	
32-bit EISA/MCA/proprietary slots	0, 0, 1	None	None	None	None	None	None	
Local-bus slots	1	None	1	None	None	None	None	
Parallel, serial, mouse ports on motherboard	None	1, 2, 0	1, 2, 0	None	1, 2, 0	1, 2, 0	1, 1, 0	
Integrated network adapter option	None	None	None	None	None	None	None	
Video								
Display circuitry location	Proprietary local bus	Motherboard	Vesa local bus	ISA card	Motherboard	ISA card	ISA card	
Video chip set manufacturer	Tseng	Headland	NCR	S3	WD	S3	Tseng	
Software								
DOS 5.0/Microsoft Windows 3.1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	
Other bundled software	□	□	□	□	□	□	□	
Miscellaneous								
Warranty	1 year	1 year	1 year	1 year	1 year	2 years	2 years	
First-year on-site service charge	\$80	Included	\$39	Included	Included	\$29	N/A	

N/A—Not applicable. The product does not have this feature. AiR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

COMPUTERS
486DX2/66s

Poly 486-66LM	OSI Kionimus 486DX2/66	Quill Otech 486 4D2/66	Silicon Pylon II 486DXi-212	SST 486DX2-66MWC	Standard Windows Workstation Plus
\$3,300	\$3,650	\$3,520	\$2,895	\$2,800	\$3,845
320MB	340MB	334MB	212MB	212MB	240MB
■ ■	□ ■	□ ■	■ ■	■ ■	□ ■
Tower	Small-footprint	Small-footprint	Mini-tower	Desktop	Desktop
ISA	ISA	ISA	ISA	ISA	EISA
250 watts (5)	200 watts (4)	230 watts (5)	220 watts (4)	200 watts (2)	200 watts (4)

Orchid	Contaq	TMC	SVC	SST	BCM
OPTi	Contaq	OPTi	OPTi	OPTi	Intel
Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	Processor card
AMI (7/7/91)	AMI (12/12/91)	AMI (6/6/91)	SVC 4020A	AMI (12/12/91)	AMI (5/5/91)
□	□	■	■	■	■
■	■	□	□	□	□

4MB-32MB	1MB-32MB	1MB-32MB	1MB-64MB	4MB-32MB	4MB-64MB
64K-256K	64K-256K	64K-256K	64K-256K	64K-256K	64K-256K
Four-way set-associative	Direct-mapped	Direct-mapped	Two-way set-associative	Direct-mapped	Direct-mapped
Write-back	Write-back	Write-back	Write-back	Write-back	Write-through

3, 2	3, 1	3, 2	3, 3	3, 1	3, 1
0, 1	1, 0	None	0, 1	None	0, 1
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	Dual	1.2MB, 1.44MB
120MB-2GB	40MB-1.2GB	40MB-1.2GB	42MB-528MB	80MB-2GB	130MB-500MB
ISA card	ISA card	ISA card	ISA card	ISA card	EISA card

0, 7	2, 6	2, 5	0, 8	1, 7	0, 1
0, 0, 1	None	None	None	None	6, 0, 0
None	None	None	None	None	None
None	None	None	None	None	None
None	None	None	None	None	None

Proprietary local bus	ISA card	ISA card	ISA card	ISA card	ISA card
S3	ATI	S3	S3	S3	ATI

■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
□	□	■	□	■	■

2 years on parts, 5 years on labor	2 years	1 year	1 year	1 year	2 years
\$75	Included	Included	N/A	Included	Included

CONTINUES

on an add-in card. The memory banks, located beneath an array of wires, are between the power supply and an expansion slot, making them difficult to reach. An enormous heat sink sits on top of the CPU, which is nestled in proximity to the drive bays.

Although the high disk score gives overall DOS performance a boost, memory and video scores were below average, while the CPU scored slightly above the mean on our processor test suite. Under Windows testing the ATI-486-66 system performed in the middle of the pack in disk performance, and pulled in average scores on our graphics Winmark test routines as well.

The system's five drive bays (three 5.25-inch, two 3.5-inch) are front-accessible. Of the nine slots, six are free for future expansion. The CTX ProScan monitor was one of the finest we saw among these tested machines. Its 15-inch screen, tilt and swivel base, and full line of front-accessible controls make it stand out despite the slightly sluggish 60-Hz refresh rate at 1,024-by-768.

In addition to the standard one-year warranty on parts and labor, ATronics International offers first-year on-site service for \$99. After that, on-site is only available through a separate customer contract with Nationwide Warranty.—BG

Austin Computer Systems Inc.

Austin 466DX2 WinStation

Banking on local-bus video, the \$2,990 Austin 466DX2 WinStation from Austin Computer Systems turned in some of the best DOS and Windows video scores for this test group on PC Magazine Labs'



The Austin 466DX2 WinStation

COMPUTERS
486DX2/66s

► **S U M M A R Y O F F E A T U R E S**

Products listed in alphabetical order

■ = YES □ = NO

	Swan 486DX2-66DB	Tangent Model 466ex	Tri-Star 66/DX2-VL	Twinhead Superset 600/462D	USA Flex 486DX2/66	U.S. Micro Jet 486DX2-66	
List price (PC Magazine configuration)	\$4,684	\$3,966	\$3,569	\$2,999	\$3,799	\$3,450	
Hard disk capacity	318MB	340MB	340MB	212MB	248MB	336MB	
Dealers/Direct-distribution channel	□ ■	□ ■	■ ■	■ ■	□ ■	□ ■	
Case style	Desktop	Tower	Tower	Small-footprint	Tower	Desktop	
Bus architecture	ISA	EISA	ISA	ISA	EISA	ISA	
Power supply (and number of connectors)	200 watts (5)	200 watts (4)	300 watts (8)	150 watts (5)	250 watts (6)	230 watts (5)	

Motherboard and CPU

Motherboard manufacturer	Swan	Micro Center	Micronics	Twinhead	Cache Computers	Asus	
Chip set manufacturer	Syscon	SIS	C&T/Micronics	ACC/Twinhead	Cache Computers	SIS	
Processor upgrade path	Processor card	Standard socket	Standard socket	Standard socket	Standard socket	Standard socket	
BIOS version (or date)	AMI (5/5/91)	SIS-EISA-F (12/1/91)	Phoenix (1/15/88)	Phoenix 1.01	Phoenix A45596	AMI (5/5/91)	
Flash memory	■	□	■	■	□	□	
Weitek/Cyrix coprocessor socket	□	■	□	□	□	■	

Memory and Processor RAM Cache

Installable RAM	4MB-64MB	4MB-128MB	4MB-64MB	1MB-64MB	1MB-64MB	1MB-64MB	
External RAM cache	128K	64K-256K	0-256K	64K-256K	128K-256K	64K-256K	
Cache architecture	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	Direct-mapped	
Cache write design	Write-back	Write-back	Write-through	Write-through	Write-back	Write-through	

Disk Drives

Accessible drive bays (5.25", 3.5")	5, 0	3, 2	4, 0	2, 1	5, 0	3, 2	
Internal drive bays (5.25", 3.5")	0, 1	0, 1	4, 0	0, 1	1, 0	None	
Floppy disk drives	1.2MB, 1.44MB	Dual	1.2MB, 1.44MB	1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	
Hard disk options	120MB-1.6GB	200MB-3GB	210MB-1.7GB	120MB-500MB	105MB-1.2GB	40MB-1.2GB	
Disk controller location	Motherboard	EISA card	Motherboard	Motherboard	EISA card	ISA card	

Expansion Bus

8-bit/16-bit slots	0, 6	0, 2	0, 6	0, 4	None	0, 7	
32-bit EISA/MCA/proprietary slots	None	6, 0, 0	None	None	7, 0, 0	0, 0, 1	
Local-bus slots	None	None	2	None	None	None	
Parallel, serial, mouse ports on motherboard	1, 2, 0	None	1, 2, 0	1, 2, 1	None	None	
Integrated network adapter option	None	None	None	None	None	None	

Video

Display circuitry location	Proprietary local bus	ISA card	VESA local bus	Motherboard	ISA card	ISA card	
Video chip set manufacturer	S3	WD	ATI	Cirrus	S3	Orchid	

Software

DOS 5.0/Microsoft Windows 3.1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	
Other bundled software	□	□	□	□	□	□	

Miscellaneous

Warranty	2 years	1 year	2 years on parts, lifetime on labor	1 year	1 year	1 year on parts, 2 years on labor	
First-year on-site service charge	Included	Included	Included	Included	Included	\$195	

N/A—Not applicable: The product does not have this feature. AIR—Advanced Integrated Research Inc., AMI—American Megatrends Inc., Asus—Asus Tek Computer Inc., ATI—ATI Technologies Inc., BCM—BCM Advanced Research Inc., C&T—Chips & Technologies Inc., ECS—Elite Group Computer Systems Inc., GSS—GSS Inc., HP—Hewlett-Packard Co., MCCI—Micro Center Computer Inc., SIS—Silicon Integrated Systems Corp., TI—Texas Instruments Inc., TMC—TMC Research, UMC—United Microelectronics Corp., VLSI—VLSI Technology Inc., WD—Western Digital, ZEN—ZEN Systems Inc.

SUITABILITY TO TASK

Austin 486DX2 WinStation

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	●

performance test routines.

Within the standard desktop case is 8MB of RAM, upgradable to 64MB on the Micronics motherboard. An Intel upgrade socket is partially blocked by the CPU's heat sink. The 64K external cache is easy to upgrade, as is the Flash BIOS. With both the IDE disk adapter and the ATI UltraPro VESA local-bus video integrated on the motherboard, seven 16-bit slots are left open for expansion. Two, however, cannot accept full-length cards because of the location of the SIMM banks. Three 5.25-inch bays are accessible from the front; two 3.5-inch bays are internal.

Except for the average DOS disk score logged by its Western Digital Caviar 220MB IDE hard disk with a 64K cache, the Austin's performance on PC Labs DOS test suite was excellent. Video

performance in particular was in the top ten due to the 4MB of VRAM and local-bus design.

Windows performance was exceptional among these systems: Only the Zeos International entry could top the Austin on PC Labs' Graphics Winmark test routines. The 15-inch MAG monitor is the top of Austin's line. It operates admirably, with a 72-Hz refresh rate at 1,024-by-768 resolution.

The Austin Computer Systems warranty covers parts and labor for one year. On-site service from either Austin or General Electric is free for the first year. You can reach Austin's technical support on a toll-free line 24 hours a day, seven days a week or via an electronic bulletin board.—BG

Bi-Link Computer Inc.

Bi-Link Desktop i486DX2/66

Bi-Link Computer divides its product line into two categories: portables and desktops. The latter category includes the \$2,665 Bi-Link Desktop i486DX2/66, a huge tower that unfortunately leaves room for little else on top of your desk. If its disk scores were a bit better, it could be considered as a candidate for a low-cost file server.

With a tower as tall as the Bi-Link, there is no shortage of expansion room. Six bays are accessible; two are internal. The AIR motherboard, a standard size with six vacant 16-bit ISA slots, can hold 32MB of SIMMs. All of the wires are intelligently kept in the space between the drive bays and the motherboard, which makes everything inside the machine easily accessible.

Unfortunately, the unit's huge size



The Bi-Link Desktop i486DX2-66

FACT FILE

Austin 486DX2 WinStation

Austin Computer Systems Inc., 10300 Metric Blvd., Austin, TX 78758; 800-752-1577, 512-339-3500; fax, 512-454-1357

List price (tested configuration): \$2,990

Memory and processor RAM cache: 8MB 70-ns SIMMs, 64K cache.

Disk drives and controller: Western Digital Caviar 2200 14-ms. 220MB IDE hard disk with 64K cache, adapter integrated on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: ATI UltraPro Mach 32 local-bus video with 2MB VRAM, MAG LX1564 15-inch monitor, 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1, Viruscan.

In short: The Austin 486DX2V WinStation with local-bus video comes stacked with many extras, while delivering premium performance for a very reasonable price. Its Windows graphics performance and DOS video results were among the best in the test group, but disk scores were disappointing.

ON READER SERVICE CARD

Wyse Decision 486si	ZDS Z-Station 466Xh Model 200	Zeos 486DX2-66
\$3,299	\$4,095	\$2,995
213MB	200MB	245MB
■ □	■ ■	□ ■
Slimline	Slimline	Desktop
ISA	ISA	ISA
200 watts (5)	200 watts (4)	300 watts (5)

Wyse	ZDS	Zeos
OPTi	ZDS	VLSI
ZIF socket	Standard socket	ZIF socket
Wyse 251248-01 1.0	ZDS V4.1D	Phoenix 1.01
□	■	■
■	■	□

4MB-64MB	4MB-64MB	2MB-64MB
64K-256K	None	0-256K
Direct-mapped	N/A	Direct-mapped
Write-back	N/A	Write-through

2, 3	0, 2	2, 2
None	3, 0	2, 1
1.2MB, 1.44MB	1.44MB	1.2MB, 1.44MB
120MB-213MB	120MB-400MB	85MB-1.1GB
Motherboard	Motherboard	Motherboard

1, 5	0, 4	1, 7
None	None	None
None	None	2
1, 2, 1	1, 1, 1	1, 2, 0
None	Ethernet	None

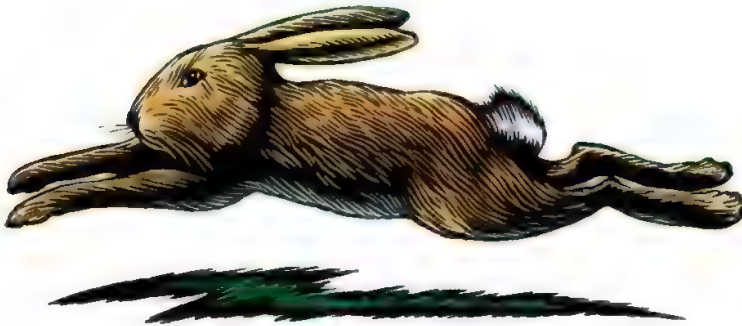
Proprietary local bus	Motherboard	VESA local bus
Tseng	WD	Weitek

■ ■	■ ■	■ ■
□	■	■

1 year	1 year	1 year
\$99	N/A	\$49

ENDS

NOW BACKPACK IS SMALLER. AND FASTER.



We've just made it easier to backup your hard drive with our 250 MB parallel port tape backup unit. One model works with all PC compatibles and portables.

Here's why:

Backpack is easy to install. Plug Backpack into the parallel printer port. Then plug the printer into Backpack!

Backpack requires no cards.

Backpack is 30% smaller (1-1/2 h x 4 w x 7-3/4 l).

Backpack is easy to transport and share between computers (2-1/2 lbs).

Backpack can backup at a speed of up to 9 MB per minute.

Backpack is a QIC 80 compatible and can read QIC 40 tapes.

So don't get left in the dust. Call for more information today.

Micro Solutions, 132 W. Lincoln Hwy., DeKalb, IL 60115,
815-756-3411, FAX: 815-756-2928

backpack

MicroSolutions
Computer Products



CIRCLE 005 ON READER SERVICE CARD

PROTECT YOUR COPIES OF PC MAGAZINE

Make your collection of PC Magazine a handsome addition to your office or home—and protect and organize your copies for easy reference!

PC Magazine Binders and Cases are made of durable, luxury-look leatherette over quality binder board. Custom designed for PC Magazine, every order receives FREE transfer foil to mark dates and volume numbers.

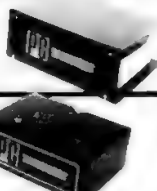
FOR FAST SERVICE CALL TOLL-FREE 1-800-825-6690

MAGAZINE BINDERS

Hold your issues on individual snap-on rods. \$9.95 each; 3 for \$27.95; 6 for \$39.95.

OPEN BACK CASES

Store your copies for individual reference. \$7.95 each; 3 for \$21.95; 6 for \$39.95.



PC MAGAZINE

Please send ☐ Binders ☐ Cases Quantity _____
Payment enclosed \$_____. * Add \$1 per case/binder for postage & handling. (Outside USA, add \$2.50 per case/binder ordered, US currency only.)

Charge my:
☐ Amex ☐ Visa ☐ MC (Minimum order \$15)

Card No. _____ Exp. Date _____

Mr./Mrs./Ms. _____
Please Print Full Name

Address _____
No P.O. Numbers Please

City _____

State _____ Zip _____

* PA residents add 6% sales tax.

FACT FILE

Bi-Link Desktop i486DX2/66

Bi-Link Computer Inc., 11606 E.
Washington Blvd., Suite A, Whittier, CA
90606; 800-888-5369, 310-692-5345;
fax, 310-695-9623

List price (tested configuration): \$2,665

Memory and processor RAM cache: 8MB 70-ns.
SIMMs, 256K cache

Disk drives and controller: Maxtor 7213A 15-ms
210MB IDE hard disk with 64K buffer, DFI MIO-400F
adapter, 1.2MB and 1.44MB floppy disk drives.

Display: AIR AVIEW2 proprietary local-bus video
adapter with 1MB RAM and S3 chip set, TVM Media-
Scan 4A+ 14-inch monitor, 70-Hz refresh rate at 1,024-
by-768 noninterlaced

Software: DOS 5.0, Microsoft Windows 3.1.

In short: This large tower system excels at Windows
graphics but at little else. Its local-bus video design
is proprietary and cannot accept VESA-compliant cards.
Bi-Link's lack of on-site service contracts should weigh
into your decision as much as this system's low price

518 ON READER SERVICE CARD

does not translate into performance. The
Maxtor drive and DFI controller pro-
duced below-average disk scores on both
the DOS and Microsoft Windows test
routines; memory and processor scores

SUITABILITY TO TASK

Bi-Link Desktop i486DX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

under DOS were similarly unimpressive.
Thanks to its S3 chip set, however, the
Bi-Link received good Graphics Win-
mark scores, placing in the top fourth of
DX2/66 systems reviewed. One caveat,
however, is that Bi-Link's local-bus video
is a proprietary design, so you cannot use
VESA-standard cards. Moreover, you
would expect a tower system of this size
to have better disk performance than
Windows graphics performance.

Bi-Link offers a standard one-year
warranty on parts and labor but no on-
site service. The technical support line is
not toll-free, though you can be routed
through their main 800 number.—BG

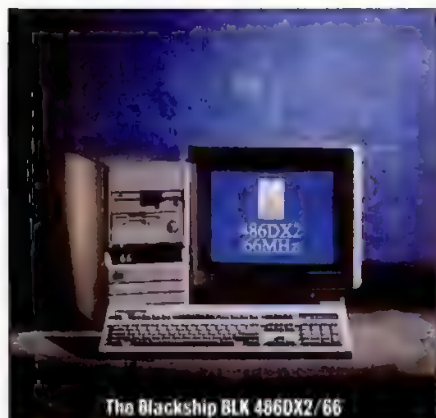
COMPUTERS

486DX2/66s

Blackship Computer Systems Inc.

BLK 486DX2/66

Buying the BLK 486DX2/66 is a safe bet, unless fast video performance under Windows is a must. The 486DX2/66's equipment list and quality construction handily justify this PC's moderate \$2,995



The Blackship BLK 486DX2/66

price.

The Blackship's small tower case is well made. The five drive bays (four external and one internal) may seem limiting to some users, but the nicely finished interior is otherwise appealing. The

smooth, shiny, sturdy internal support pieces reflect the company's concern for quality and prevent scratches when you are replacing components. The smooth edges also lessen the chance of fraying the cables.

The Blackship's IDE hard disk interface is integrated onto the AMI motherboard. Unfortunately, the integrated controller and the Maxtor IDE hard disk on our test unit yielded subpar performance relative to systems with faster components. Though the test unit's Disk Winmark score was about average, its DOS disk score fell below the mean.

The video circuitry is located on an expansion card. If you're a Windows user, however, you will want to specify a different video adapter because the Orchid graphics adapter, which has a Tseng chip set and 1MB of video RAM, produced

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	☐	☐	☐	☐
Windows applications	☐	☐	☐	☐
Expandability	☐	☐	☐	☐

a Graphics Winmark score that was dead last. Under DOS, its video performance was also below the mean.

Adding higher-power components such as a Windows accelerator card would raise the Blackship's price, but this system would still be worth purchasing, even for a few hundred dollars more. If you want local-bus video, you'll need a different computer, but for more hard disk space, just ask for a bigger case.

Blackship offers a warranty that covers parts and labor for one year. On-site service is included free during the first year.—Bruce Brown

Blue Star Marketing

Blue Star 466D2U

If you use DOS and Microsoft Windows applications equally and can manage without the very fastest processor performance, the ISA-based Blue Star 466D2U is worth a look. For \$2,949, Blue Star Marketing includes a hard disk that is larger than average and a 15-inch flat-screen monitor. There is nothing exciting



The Blue Star 466D2U

about the design of the full-size desktop case, but its sturdy support brackets and six drive bays are a good value for a single-user system.

The company neither skimped on this system nor veered toward extravagance. One measure of the care Blue Star used when selecting components is the system's Samsung 15-inch flat-screen monitor. The display has a crisp, 0.28-mm dot pitch and a speedy 70-Hz vertical refresh rate.

The Diamond SpeedStar video adapter, which carried a Western Digital Windows accelerator and 1MB of video RAM, appeared in many other systems

FACT FILE

BLK 486DX2/66

Blackship Computer Systems Inc., 2031 O'Toole Ave., San Jose, CA 95131; 800-531-7447, 408-432-7500; fax, 408-432-1443

List price (tested configuration): \$2,995

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache

Disk drives and controller: 213MB Maxtor 7213A IDE hard disk with 32K buffer, IDE controller integrated onto the AMI Super Voyager motherboard, 1.2MB and 1.44MB floppy disk drives

Display: Orchid ProDesigner II adapter with 1MB RAM, 14-inch ViewSonic 6 monitor with a 72-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1

In short: The BLK 486DX2/66 system was not configured for speedy Microsoft Windows performance on PC Magazine Labs' benchmark tests. It remains a well-constructed system that, at \$2,995, is a good deal—even when you add a few hundred dollars for a Windows accelerator video adapter.



ON READER SERVICE CARD

FACT FILE

Blue Star 466D2U

Blue Star Marketing, 2312 Central Ave., Minneapolis, MN 55418; 800-950-8884, 612-788-5000; fax, 612-788-3442

List price (tested configuration): \$2,949

Memory and processor RAM cache: 8MB 60-ns SIMMs, 256K cache

Disk drives and controller: 340MB Maxtor LXT340A IDE hard disk, Blue Star IDE I/O controller, dual 1.2MB/1.44MB floppy disk drive

Display: Diamond SpeedSTAR 24X video card with 1MB RAM, 15-inch Samsung monitor with 70-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, Biz Base Silver, PC-Calc Plus spreadsheet, PC-File 5.0 database, PC-Write 3.03 word processor

In short: The \$2,949 Blue Star 466D2U offers a lot for the money. It was a moderate performer on PC Magazine Labs' benchmark tests under both DOS and Windows. Making good use of its Diamond SpeedSTAR 24X video adapter, the unit produced above-average DOS video and Graphics Winmark scores.



ON READER SERVICE CARD

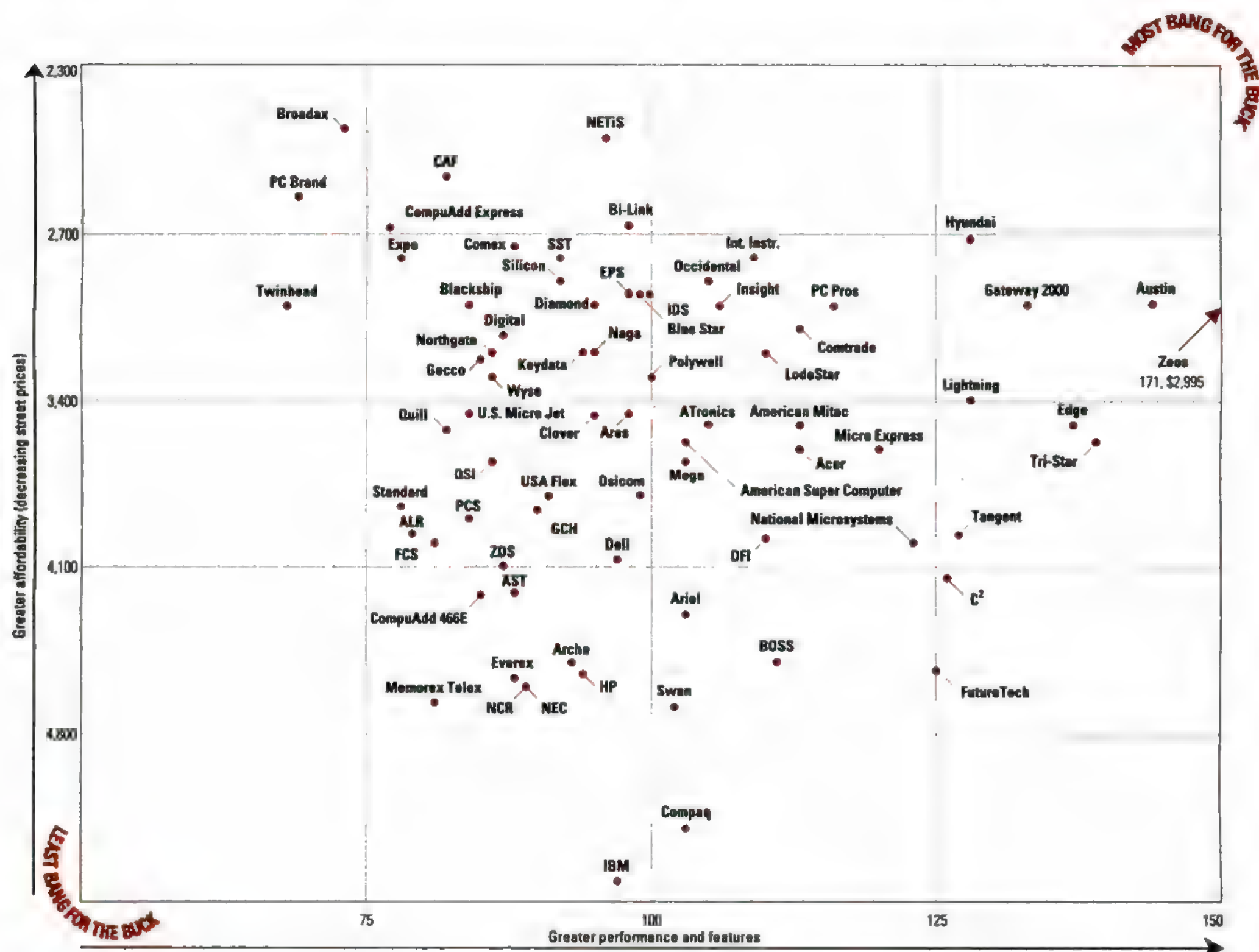
■ Price/Performance Index: 486DX2/66 PCs

Seven of the 74 486DX2/66 systems we tested fell into the optimal price/performance corner of our Bang for the Buck chart, a region that features those products with the best test results, features, and prices.

At \$2,995, the Zeos 486DX2-66 stands out as a value leader, thanks in part to excellent graphics video performance, plenty of expansion room, a ZIF (zero-insertion-force) processor socket, VESA local bus, flash BIOS, and a 300-watt power supply. For virtually the same price, the Austin 466DX2 WinStation and Gateway 2000 4DX2-66V also offer a generous number of drive bays and expansion slots, with a Micronics local-bus motherboard and built-in I/O ports. The Gateway includes a 340MB hard disk as well. Large-capacity drives and Micronics mother-

boards also distinguish the Lightning ThunderBox and the Tri-Star 66/DX2-VL, two other players in the optimal price/performance region (which are somewhat more expensive).

Only one of the stellar seven, the Edge DX2/66, uses an EISA architecture, and it is in the mid-\$3,000 range with the Lightning and the Tri-Star. The most affordable system within the top group is the \$2,721 Hyundai 466D2. All of the highest-ranking seven scored above 125 on our performance index, while the average for the full complement of 74 systems was about 100. Many systems were clustered around that performance average. At the high end of the price scale were the \$5,415 IBM PS/2 486DX2-66 and the \$5,192 Compaq Deskpro 66M, and at the low end was the \$2,260 Broadax 486DX2-66.



THE DATA POINTS

The Bang for the Buck performance index reflects each machine's benchmark test scores, hard disk capacity, installed RAM, VGA RAM, processor socket, flash BIOS, and expansion features such as available drive bays and expansion slots. The index also reflects important extras such as local bus, 16550 Universal Asynchronous Receiver/Transmitter (UART) support, extended warranty, on-site service, and bundled software. Benchmark test scores are weighted to account

for half of the performance index; capacity and expansion features account for 45 percent, and the extras account for the remaining 5 percent. You can find more detailed data in the Software Library of PC MagNet's Editorial Forum as 02BANG.WK1.

Prices are based on our tested configuration (as listed in each product's fact file), and we discount dealer-distributed systems by 15 percent to approximate street prices.

Do You Make These Six Common Mistakes On Your Taxes?

NEW!
EasyStep™
MAKES DOING YOUR TAXES EVEN EASIER

Calculations
GUARANTEED
Accurate

Six common mistakes can cause you big headaches on your taxes. An oversight here, an omission there. From unnecessary tax payments to full blown IRS audits -- you can end up paying too much ... or worse.

But now, using TurboTax and your personal computer, you can avoid these simple but costly mistakes:

1 The Arithmetic Error

Today, even the simplest forms contain complex calculations. And with all the late-night scrambling, an innocent mistake could cost you plenty.

2 The Transcription Error

With all those numbers being juggled from schedule to schedule, it's no wonder the figures are so often transcribed incorrectly or entered on the wrong line.

3 The Omitted Form

Even "ordinary" returns require anywhere from six to a dozen forms to complete. It's easy to miss one ... or end up rushing all over town to find the one you need.

4 The Misinterpreted Instruction

At best, IRS instructions can be tough to understand. At worst they can be mind-boggling. What you need are clear directions in plain English.

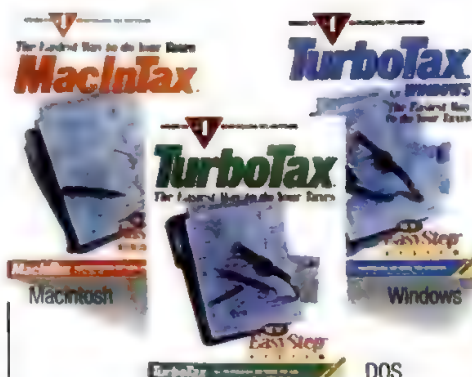
5 The Overlooked Deduction

You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

6 The Exceeded Guideline

The fastest way to trigger an IRS audit is to exceed the "normal" range on one of your deductions. You need to know what the IRS looks for on a line-by-line basis.

When you do your taxes with TurboTax, mistakes like these are virtually impossible. And filing your taxes couldn't be easier.



America's #1 Tax Software

TurboTax is America's #1 best-selling tax software -- over seven million returns were filed with TurboTax last year! With TurboTax on your PC (or MacIntax on your Macintosh) and the new EasyStep™ tax preparation process, you can completely and accurately prepare your income taxes in just a few hours.

Here's how easy it is!

- Gather your records and receipts.
- Enter your data into TurboTax.
- Print out, sign and drop in the mail.

TurboTax does the rest. Even if your records and receipts aren't in any particular order,

TurboTax's new EasyStep system will guide you every step of the way. And like a good tax advisor, TurboTax helps you identify every deduction you can claim.

Then TurboTax makes all the calculations, checks for accuracy and consistency, and transfers every number to the proper lines on the proper forms. And, TurboTax prints every form you need in IRS-approved format right on your own printer -- ready to sign and mail (or file electronically, if you prefer, for a faster refund).

PC Magazine says TurboTax "makes doing your taxes almost fun." Try it for yourself. We know that if you try it, you'll never go back to doing your taxes the old-fashioned way. In fact, we back TurboTax with our Double Guarantee:

1. Guaranteed Satisfaction. Try TurboTax, even use it to prepare your taxes. If you're not completely satisfied, return it anytime before April 15, 1993 for a full refund. No questions asked.

2. Guaranteed Accuracy. Use TurboTax with complete confidence. If TurboTax makes an error in calculation on your return, we'll pay any IRS penalty.

Free Bonus-- SimCity!

With SimCity® by MAXIS, create your own dream city and find out if you have what it takes to run a thriving metropolis, or one of 7 cities. A \$49.95 value-- yours free with your TurboTax or MacIntax order!

☐ Yes, I'll try TurboTax! Only \$49.95** ChipSoft

Rush me TurboTax ASAP. I'll save \$30.00 off list price! If I don't like it for any reason, I'll just send it back by April 15, 1993 and my payment will be refunded.

Please Choose: ☐ TurboTax (IBM®-compatible)

☐ 3-1/2" disks, or ☐ TurboTax for Windows™

☐ 5-1/4" disks ☐ MacIntax (for Macintosh®)

Name _____

Address _____

City _____

State _____

Zip _____

Bill My: ☐ Visa ☐ MasterCard ☐ Discover ☐ Amex

I understand that there is an additional \$7.50 shipping per order.

Card # _____

Exp. Date _____

Signature _____

TURBOTAX DOUBLE GUARANTEE

- Guarantee of Satisfaction-- If you're not satisfied for any reason, just return it by 4/15/93 for a full refund.
- Guarantee of Accuracy-- If TurboTax makes an error in calculation, we'll pay the IRS penalty!

Mail your order to: ChipSoft, Box 85709
Or Call NOW: San Diego, CA 92186-9668

1-800-964-1040
ext. 3131

TurboTax requires IBM PC, XT, AT, PS/2, PS/2 or compatible, DOS 3.0 or higher, 800K RAM, hard drive. TurboTax for Windows requires Windows 3.0 or higher, 2MB RAM, hard drive. MacIntax requires Macintosh Plus, System 4.2 or higher, hard drive. Offer expires 4/15/93 -- not valid with any other offer. TurboTax and MacIntax are registered trademarks of ChipSoft, Inc. and ChipSoft, Inc. Other trademarks are the sole property of their respective owners. **CA residents add 7.25% sales tax. MA residents add 6.25% sales tax. Please add \$7.50 shipping and handling per order. The retail purchase price of a copy of your credit card account is \$149.95 for electronic and mailing. Check for money order payable to ChipSoft, Inc. or to the order. ChipSoft, Inc., P.O. Box 85709, San Diego, CA 92186. All prices are U.S. dollars. SimCity, the award-winning city simulator from MAXIS. PC Magazine Editors' Choice Logo ©1992 JPR Data Communications Company.

COMPUTERS

486DX2/66s

SUITABILITY TO TASK

Blue Star 466D2U

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	●	○

tested for this roundup. This ISA-bus card delivered DOS video and Graphics Winmark scores that placed the Blue Star in the top third of the test group.

Disk performance with the Maxtor 340MB IDE hard disk was better than average under DOS but dropped to the middle of the pack under Windows.

A local-bus card with accelerated video and a caching disk controller would add to the unit's performance but would serve to raise the price as well. If you're looking for a moderately priced system with decent drive expansion, the Blue Star's construction quality and performance numbers earn it your careful consideration.

Blue Star's warranty includes prorated coverage for five years on parts and labor. On-site service costs \$59 a year for each of those five years.—BB

BOSS Technology Corp.

BOSS 466d

You might start out not wanting to pay more than the average price for a 66-MHz computer, but the BOSS 466d ISA mini-tower may tempt you into changing your mind. In return for the \$4,495 price tag, you get a well-thought-out system and excellent performance. And since BOSS Technology Corp. sells through value-added resellers, discounts are likely.



The BOSS 466d

The mini-tower BOSS is smoothly finished on the inside and holds six drive bays, five of which are externally accessible. Since the AMI motherboard integrates I/O and drive interface circuitry, the only expansion card in the system's eight slots is a Diamond Windows accelerator board. BOSS pairs

FACT FILE

BOSS 466d

*BOSS Technology Corp., 2546 NE Expwy.,
Atlanta, GA 30345; 800-628-1787,
404-636-2126; fax, 404-321-1499*

List price (test configuration): \$4,495.

Memory and processor RAM cache: 8MB 80-ns SIMMs, 256K external cache.

Disk drives and controller: 245MB Seagate ST3283A IDE hard disk with 128K cache, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond SpeedSTAR 24X video adapter, Western Digital WD90C31-LR chip set with 1MB VRAM, 15-inch CTX ProScan CPS-1580 flat-screen monitor with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: At \$4,495, the BOSS 466d is one of the more expensive systems we tested for this story. Your money does buy fine components, which logged better-than-average performance in all categories on PC Magazine Labs' benchmark tests. Its video subsystem and flat-screen monitor make this computer a very viable Microsoft Windows workstation.

 ON READER SERVICE CARD

the Diamond with a 15-inch CTX flat-screen monitor; the combination produced a better-than-average Graphics Winmark score and turned in a DOS video result that was solidly average.

The 245MB Seagate hard disk, aided by a 128K disk cache, yielded above-average DOS disk and Disk Winmark scores. Its processor and memory results were among the fastest of this roundup, and were in part due to the 60-nanosecond RAM that comes standard on this machine.

SUITABILITY TO TASK

BOSS 466d

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	○

If you initially spend this much money on a system, you will want the ability to upgrade without much added expense. The BOSS has a CPU upgrade socket on the motherboard, but it's not a ZIF (zero-insertion-force) socket—the kind that makes installing a CPU nearly worry-free. While the system limit of 32MB of RAM is tiny compared with that of other machines we tested, this amount is sufficient for today's technology and should be adequate for at least the next couple of years.

BOSS offers a two-year parts-and-labor warranty, and free on-site service from Nationwide or TRW the first two years.—BB

Broadax Systems Inc.

Broadax 486DX2-66

If you want a 66-MHz 486DX2 but price is a major concern, the Broadax 486DX2-66 is a possible candidate. At \$2,260, the price is certainly low enough for a 66-MHz system. But don't be surprised to find that such a low-cost system isn't the fastest performer.

The Broadax baby-AT desktop case has five drive bays. The quality of the case's construction is fair, with a little



The Broadax 486DX2-66

more flex than average with the case cover off. It's not flimsy, but it is less sturdy than you may prefer. The motherboard has no upgrade socket for future Intel microprocessor releases, but you can switch among current CPUs by removing the current resident and putting them in the main processor socket.

Although its DOS video score was better than its other results, all of the Broadax's DOS scores, along with its Graphics Winmark and Disk Winmark

COMPUTERS
486DX2/66s

SUITABILITY TO TASK				
Broadax 486DX2-66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

scores, fell into the bottom third of the test range. A closer look at the system components, all of which are name-brand but not high-performance items, helps explain the low test results.

The regular ISA-bus ATI video card comes with 1MB of RAM, but the lack of both a Microsoft Windows accelerator chip and local-bus video held the Broadax's scores down near the bottom of the test group. The 212MB Maxtor hard disk is an adequate IDE unit, but it was no match for the faster hard disks or cached disk controllers used by the other systems in this roundup.

One of the Broadax's nicest features, however, is the standard Fujitsu keyboard. This 101-key unit is built for comfortable use, with a nice slope and a wide wrist rest.

Broadax Systems offers a one-year

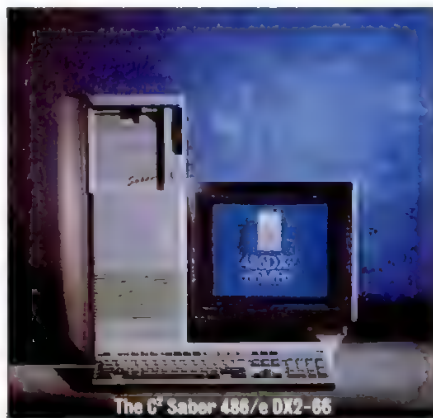
FACT FILE	
Broadax 486DX2-66	
<i>Broadax Systems Inc., 9440 Telstar Ave., #4, El Monte, CA 91731; 800-872-4547, 818-442-0020; fax, 818-442-4527</i>	
List price (test configuration): \$2,260	
Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache	
Disk drives and controller: 212MB Maxtor 7213AT IDE hard disk with 64K cache, BSI IPG006 disk controller, 1.2MB and 1.44MB floppy disk drives	
Display: ATI VGA 1024D video card with 1MB RAM, 14-inch CTX monitor with a 60-Hz refresh rate at 1,024-by-768	
Software: DOS 5.0, Microsoft Windows 3.1	
In short: Broadax Systems has traded performance for price with its \$2,260 486DX2-66 system. The Broadax was one of the slowest 486DX2/66 systems we tested. Even though the unit comes with recognizable, name-brand components, none of them offer top-of-the-line features.	
 ON READER SERVICE CARD	

parts-and-labor warranty. On-site service is optional and costs \$80 the first year.—BB

C² Micro Systems Inc.

C² Saber 486/e DX2-66

Spending extra money on a system can pay off when you need a high-powered computer for use as a file server. The C² Saber 486/e DX2-66 is a capacious EISA



tower that costs \$4,145 for the configuration we tested.

With bays for five external and four internal storage devices, the Saber is prepared for most drive needs. The big, hefty tower case has slightly rough edges on some of the internal support braces, but they're not so rough that replacing components would prove difficult.

The Saber's BCM motherboard has a modular CPU card that makes upgrading to a new processor simple. C² Micro Systems sells a variety of CPU cards for this system, ranging from a 486SX/25 to a 486DX2/66; the price spread from fastest

SUITABILITY TO TASK				
C² Saber 486/e DX2-66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	●

card to slowest is \$700. The Saber holds up to 64MB of RAM, all on the motherboard.

The Saber garnered a low processor score due to an inefficient external cache design, but its memory score was among the top 10 percent. Credit for its high Graphics Winmark score, which was also

FACT FILE	
C² Saber 486/e DX2-66	
<i>C² Micro Systems Inc., 47560 Seabridge Dr., Fremont, CA 94538; 510-683-8888; fax, 510-683-8662</i>	
List price (tested configuration): \$4,145	
Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K external cache	
Disk drives and controller: 358MB 12-ms Conner CP3360 hard disk, uncached Adaptec 1742E EISA SCSI hard disk controller, 1.2MB and 1.44MB floppy disk drives	
Display: Diamond SpeedSTAR 24X video card with 1MB DRAM, Western Digital WD90C31-LR accelerator chip, 14-inch Arche monitor with 70-Hz refresh rate at 1,024-by-768	
Software: DOS 5.0, Microsoft Windows 3.1	
In short: At \$4,145, the EISA-bus C ² Saber 486/e DX2-66 is a good buy as a file server. It has lots of room for additional drives, and it garnered good scores on our processor, memory, and disk test routines. An added bonus is a particularly high Graphics Winmark score.	
 ON READER SERVICE CARD	

among the top 10 percent, goes to the graphics-oriented Diamond adapter, with its Western Digital accelerator chip and 1MB of DRAM. Disk performance was closer to the middle of the range: Under Windows, the uncached Adaptec EISA SCSI controller held the performance of the 358MB Conner hard disk down to just a shade above the average; under DOS, however, disk performance slipped to a bit below the mean.

With tremendous drive expansion room, plenty of memory capacity, and an easy CPU upgrade path, the Saber is a good bet for a local or department network file server. C² Micro Systems offers a one-year parts-and-labor warranty, and on-site service costs \$75 the first year.—BB

CAF Technology Inc.

CAF Gold 6D2

A list price of \$2,459 makes the CAF Gold 6D2 appealing. The CAF's best performance results were for processor, where it scored just above the mean, and its Disk Winmark score, where it exactly matched the mean.

COMPUTERS
486DX2/66s



The CAF Gold 6D2

The CAF's baby-AT case had seven drive bays (two for internal devices), a CPU upgrade socket, and the potential to hold up to 128MB of RAM on the motherboard. All eight ISA slots can accommodate full-length cards. The case's internal finish is somewhat rough, but not rough enough to cause problems when you replace components.

Except for its processor and Disk Winmark scores, the CAF's performance tended to fall below the average. The Paradise graphics adapter had a Western Digital chip and 1MB of DRAM. The combination yielded a video score and a Graphics Winmark score that were lower

than average, but it did better under DOS than under Microsoft Windows. The monitor is a low-radiation, 14-inch unit from Tatung, with a 72-Hz vertical refresh rate at 1,024-by-768.

The system's 213MB Conner IDE hard disk used its own controller and integrated motherboard drive interface. Although it showed good performance under Windows, its DOS disk score was lower than the average.

This small-case system has better-than-average expansion room, and on most of our tests yielded average performance in an admittedly fast field. With decent name-brand components, it is a

SUITABILITY TO TASK

CAF Gold 6D2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

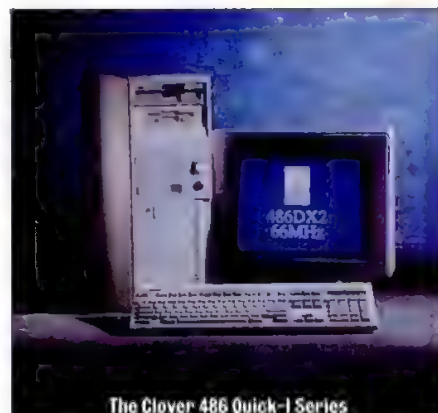
good value. For people on tight budgets who need to run typical DOS and Windows applications, it may be an appropriate single-user system. CAF Technology backs this system with a one-year-parts-and-labor warranty, which doesn't include on-site service.—BB

Clover Computer Systems Inc.

Clover 486 Quick-I Series

The \$3,549 ISA PC in Clover Computer Systems' 486DX2/66 line is an impressive unit. The Clover 486 Quick-I Series' performance ranged from average to well above average; its best scores were its disk and processor scores.

The Quickpath motherboard is laid



The Clover 486 Quick-I Series

FACT FILE

Clover 486 Quick-I Series

Clover Computer Systems Inc., 1430 Koll Circle, #102, San Jose, CA 95112; 800-925-6837, 408-436-0444; fax, 408-436-0494

List price (tested configuration): \$3,549.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.

Disk drives and controller: Quantum LPS240AT 245MB IDE hard disk with 256K cache, Quickpath Portfolio 550 adapter, 1.2MB and 1.44MB floppy disk drives.

Display: Quickpath Cyclone XGi 1,024-by-768 adapter with 1MB RAM and S3 chip set, ADI MicroScan 4E+ 15-inch monitor, 72-Hz refresh rate.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Quality parts and average to above-average performance on PC Magazine Labs' benchmark tests make the Clover 486 Quick-I Series a good candidate for server tasks. Hardware-based virus detection is another plus: The BIOS will automatically scan the system for viruses every time you start up the Clover machine.



out well. Memory banks that hold 32MB of RAM, the system total, are located just left of the IDE hard disk controller, and the intelligent placement of wires makes upgrading painless. The CPU sits in a ZIF (zero-insertion-force) socket. The noticeably absent CPU heat sink is a shortcoming, since most 486DX2/66 PCs have them. Six full-length ISA slots are open. Virus protection that is built into the Micro Research BIOS scans the hard disk for viruses every time you boot up the Clover. Password protection is also built into the system.

The Clover produced processor and disk scores that were well above the average. While its video performance under DOS was slow, the Clover's Graphics Winmark score was solidly in the middle of the pack; this is a pattern we have come to expect from the S3 video chip set.

SUITABILITY TO TASK

Clover 486 Quick-I Series

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

FACT FILE

CAF Gold 6D2

CAF Technology Inc., 1315 Johnson Dr., City of Industry, CA 91745; 800-336-9369, 818-369-3690; fax, 818-369-3692

List price (tested configuration): \$2,459.

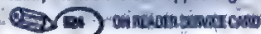
Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.

Disk drives and controller: 213MB 18-ns Conner CP30304 IDE hard disk (with its own controller and integrated interface on motherboard), 1.2MB and 1.44MB floppy disk drives.

Display: Paradise SVGA Windows Accelerator video card with Western Digital WD90C31 chip set with 1MB DRAM, 14-inch Tatung CM14UAE monitor with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The CAF Gold 6D2's scores on our benchmark tests were uneven: a processor test score slightly above the mean and a Disk Winmark score that exactly matched the mean. The \$2,459 price, however, certainly makes the CAF appealing.



COMPUTERS

486DX2/66s

The 15-inch MicroScan monitor had a refresh rate of 72 Hz at 1,024-by-768 resolution. Because you can set the rate anywhere from 50 Hz to 100 Hz, you can switch video adapters and resolutions virtually at will. If you don't prefer the Quickpath video adapter, which comes standard with the computer, Clover offers a Diamond Stealth VRAM or an Orchid Fahrenheit 1280* at no extra cost. Four 5.25-inch drive bays are accessible; three 3.5-inch bays are internal.

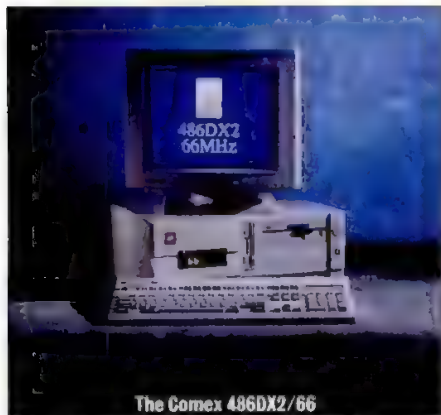
Clover includes one year of free on-site service from Nationwide in the warranty, which covers the motherboard, video, and I/O cards for three years and labor for one year. Toll-free technical support is available Monday through Saturday.—BG

Comex Computer Corp.

Comex 486DX2/66

The Comex 486DX2/66 is an all-around reasonable system: It has reasonable features, offers reasonable performance, and comes with a reasonable price. At \$2,750, the Comex is one of the lower-priced PCs in this roundup.

The Comex's features aren't dazzling. It came to us with 8MB of RAM, a 202MB hard disk, and a 256K external RAM cache, plus an ATI video adapter with a Mach 8 chip set and an Amazing Technologies 14-inch monitor. Even so, Comex Computer Corp. has carefully successfully arranged these average features into a product that is greater than the sum of its parts.



The Comex 486DX2/66

The Micronics motherboard is neatly laid out and easily accessible. A large heat sink helps cool the CPU, but unfortunately it also partially covers the

Weitek coprocessor. The CPU in turn is partially obstructed by the hard disk. You can upgrade the memory to 32MB on the motherboard and add another 32MB with an expansion card. Drive expansion includes three front-accessible bays and

SUITABILITY TO TASK				
Comex 486DX2/66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

two internal bays, while six 16-bit ISA slots are available to accommodate add-in cards. A Dexxa mouse was included.

The Comex's performance was not spectacular, but it wasn't abysmal, either. Its DOS memory and processor scores reflected the 256K Micronics external cache. The Western Digital hard disk, operating without a buffer or cache, turned in a DOS disk score that was near the bottom of the pack and an average Disk Winmark result. Graphics performance under Microsoft Windows was in line with that typically produced by the ATI video card—above the average—while the PC's DOS video score was so-so.

FACT FILE

Comex 486DX2/66

Comex Computer Corp., 3450 S. Broadmont, #110, Tucson, AZ 85713; 800-926-6392, 602-792-0100; fax, 602-792-9722

List price (tested configuration): \$2,750

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K external cache.

Disk drives and controller: Western Digital Caviar 2200 15-ms 202MB IDE hard disk, Boca Research IDE Plus adapter, 1.2MB and 1.44MB floppy disk drives

Display: ATI Graphics Ultra Mach 8 adapter with 1MB DRAM, Amazing Technologies CM-8428MX 14-inch monitor with 60-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1

In short: The Comex 486DX2/66's features and performance on PC Magazine Labs' benchmark tests were average. Even so, you might be interested in this computer because of its low price, which should leave enough room in your budget to allow for some upgrades to higher-performance components



ON READER SERVICE CARD

Comex includes a warranty that covers parts and labor for two years. On-site service is included free for the same duration. Tech support is available weekdays.—BG

Compaq Computer Corp.

Compaq Deskpro 66M

With its \$5,192 Compaq Deskpro 66M, Compaq Computer Corp. has delivered another performance punch that will probably keep the competition reeling for some time. With excellent performance, wonderfully simple upgradability, and many added frills, Compaq has gone a long way toward justifying its still-heavy price tag.

Delving under the hood of a Deskpro is always a pleasure, and this most recent version wasn't a disappointment. The



The Compaq Deskpro 66M

Deskpro 66M is a well-designed EISA system that offers modular upgradability. Though this level of upgradability raises the price a little, you'll appreciate the fact you have it when you need some extra processing power. A proprietary I/O card, which is located beneath the power supply, houses the mouse connector, BIOS chips, and standard Business Audio, which allows you to embed voice messages, music or sound effects in Microsoft Windows 3.1 documents; a plus when preparing presentations.

SUITABILITY TO TASK				
Compaq Deskpro 66M				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	●

FACT FILE

Compaq Deskpro 68M

Compaq Computer Corp., 20555 State Hwy.
249, Houston, TX 77070; 800-345-1518,
713-370-0670

List price (tested configuration): \$5,192.

Memory and processor RAM cache: 8MB 80-ns
SIMMs, 256K cache.

Disk drives and controller: Conner CP-32018 16-ms
211MB IDE hard disk, Compaq controller, 1.44MB
floppy disk drive.

Display: Compaq QVision 1024/E adapter with 1MB
VRAM, 15-inch Compaq QVision 150 Color Monitor
with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1, Business
Audio.

In short: The Compaq Deskpro 68M has an excellent
design and had terrific performance on PC Magazine
Labs' benchmark tests. But even with these pluses in
its favor, new technological developments may give
this computer stiff competition, as will other computer
makers on price.

ON READER SERVICE CARD

The only occupied standard slot contains the now-famous QVision EISA video card. The 15-inch Compaq QVision 150 Color Monitor was excellent to view.

The Compaq's performance was stellar in almost every category. Its processor, memory, and, of course, DOS video and Graphics Winmark scores were all top-notch, although the QVision card is getting some stiff competition from new developments such as the Micronics VL-Bus system. Compaq's 211MB hard disk produced DOS disk and Disk Winmark scores that were below the average; this was primarily due to the absence of a hardware cache.

Compaq offers a warranty that covers parts and labor for one year, and on-site service is free during the first year. No extended warranties are available.—OR

CompuAdd Computer Corp.

CompuAdd 466E

CompuAdd Computer Corp. attacks the 486DX2/66 EISA market from one more vantage point: Although its \$4,213 CompuAdd 466E is less competitively priced than others in this roundup, this PC nev-

ertheless offers above-average performance and high-quality components.

Looking inside the CompuAdd 466E, you won't find any cutting-edge technology, such as local-bus video or a SCSI-2 hard disk, but you will see name-brand components spliced together in such a fashion as to give you plenty of bang—



The CompuAdd 466E

but for a price.

Our only complaints with the CompuAdd motherboard were the placement of the upgradable CPU socket and secondary cache modules. They were located deep beneath the drive bay assembly, which means you would have to remove the drives and drive bays completely before you could upgrade. Also, our test

FACT FILE

CompuAdd 466E

CompuAdd Computer Corp., 12303
Technology Blvd., Austin, TX 78727; 800-
456-3116, 512-250-1489; fax, 512-331-6236

List price (tested configuration): \$4,213.

Memory and processor RAM cache: 8MB 70-ns
SIMMs, 256K cache.

Disk drives and controller: Western Digital Caviar
2200 16-ms 212MB IDE hard disk, AccuLogic controller,
1.2MB and 1.44MB floppy disk drives.

Display: CompuAdd Windows Accelerator adapter
with Western Digital WD90C31-ZS chip set and 1MB
DRAM, CompuAdd 51109 14-inch monitor with 72-Hz
refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: CompuAdd Computer Corp. offers solid
components that added up to very competitive performance on PC Magazine Labs' benchmark tests. Its price, however, is not as competitive for a computer that lacks high-performance extras.

ON READER SERVICE CARD

SUITABILITY TO TASK

CompuAdd 466E

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

unit came with some SIMMs bent in an ad hoc modification to make room for full-length expansion cards. Aside from this engineering faux pas, the CompuAdd 466E is put together well, and its CompuAdd monitor provided excellent images.

The unit included a Western Digital 213MB IDE hard disk with no cache memory, a CompuAdd controller as well as a CompuAdd video adapter with 1MB of RAM, and a Western Digital chip set. Its maximum resolution was 1,024-by-768 at a 72-Hz refresh rate.

This computer's DOS memory and video scores were above the average, its DOS processor result was average, and its DOS disk score was below the average. Under Microsoft Windows, the CompuAdd 466E posted an average disk score but a below-average Graphics Winmark result.

CompuAdd covers this computer with a one-year warranty on parts and labor, along with free on-site service.—OR

CompuAdd Express

CompuAdd Express

466DX2 Scalable

For \$2,675, CompuAdd Express is offering a competitively priced slimline computer, the CompuAdd Express 466DX2



The CompuAdd Express 466DX2 Scalable

COMPUTERS

486DX2/66s

SUITABILITY-TO TASK

CompuAdd Express 466DX2 Scalable

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

Scalable. And for users who don't require the pinnacle of performance from their 486DX2/66, this PC will be just fine. If you need cutting-edge performance or internal expandability from your computer, however, this entry falls short.

For those who prefer a slimline case, this one is adequate. The company must have figured that you wouldn't want to dig into it very much, because opening and closing the case was an exercise in frustration. Internally, the components are crowded; access to certain parts of the system board was difficult, though the memory and the processor are reachable.

This slimline's design does have one notable plus over the designs of other slimlines: The Express system not only offers the usual three 16-bit slots on the left side of the perpendicular T-bracket

expansion socket, it also comes with a couple of 8-bit slots, which are located on the right side of the expansion socket. These extra slots can handle only half-length cards.

The Express's performance on our benchmark tests was uneven. Its memory score was below the average; this was probably due to the 128K external processor cache, which was not large enough to keep the speedy DX2/66 processor filled with data. And while its Disk Winmark score was also disappointing, the Express's Tseng ET4000 video chip set produced a DOS video score that soared. Unfortunately, the Express wasn't able to produce an impressive Graphics Winmark score.

CompuAdd backs this computer with a one-year parts-and-labor warranty and free first-year on-site service.—OR

Comtrade

Comtrade 486 EISA

Dream Machine

The \$3,095 Comtrade 486 EISA Dream Machine doesn't cost as much as other EISA-bus 486DX2/66 systems, yet it performed exceedingly well on PC Magazine Labs' DOS benchmark tests, almost leading the class in terms of processor and



The Comtrade 486 EISA Dream Machine

memory performance. If you use Windows, however, you'll probably want to make some hardware changes.

The medium tower case's drive bay complement of six externally accessible and two internal bays is adequate. The case itself is cheaply made: Several internal edges are rough, which means that reaching inside to change drives or add memory might be a bit uncomfortable.

FACT FILE

Comtrade 486 EISA Dream Machine

Comtrade, 15314 E. Valley Blvd., City of Industry, CA 91746; 800-969-2123, 818-961-6688; fax, 818-369-1479

List price (tested configuration): \$3,095

Memory and processor RAM cache: 8MB 60-ns SIMMs, 256K external cache

Disk drives and controller: Western Digital WD Caviar 2200 12-ms 212MB hard disk, DC-620 EISA/IDE Cache Controller with 1MB cache, 1.2MB and 1 44MB floppy disk drives

Display: Diamond SpeedSTAR 24X adapter with 1MB DRAM, MAG 15-inch monitor with 76-Hz refresh rate at 1,280-by-1,024

Software: DOS 5.0, Microsoft Windows 3.1, Z-Nix

In short: The well-priced Comtrade 486 EISA Dream Machine turned in an excellent DOS disk score on PC Magazine Labs' benchmark tests, but it faltered in terms of its performance under Microsoft Windows. The presence of eight EISA expansion slots on the motherboard is a definite plus



ON READER SERVICE CARD

Comtrade's ECS motherboard has seven standard EISA slots and one proprietary local-bus slot, which was used for a 32-bit DC-620 EISA/IDE Cache Controller. The Western Digital 212MB hard disk logged a DOS disk score that placed among the top fifth of the 486DX2/66 machines we tested for this roundup. However, the computer's Disk Winmark score was one of the lowest.

Under DOS and Microsoft Windows, the Comtrade's video performance was more consistent than its disk performance. The Western Digital hard disk produced a below-average Windows disk test score but yielded a strong mark on the DOS disk result. The Diamond video adapter generally performs much better than it did when we tested it with the Comtrade. Processor and memory scores

SUITABILITY-TO TASK

Comtrade 486 EISA Dream Machine

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	●

FACT FILE

CompuAdd Express 466DX2 Scalable

CompuAdd Express, 12306 Technology Blvd., Austin, TX 78727; 800-925-3000, 512-219-2800; fax, 512-219-2890

List price (tested configuration): \$2,675

Memory and processor RAM cache: 8MB 70-ns SIMMs, 128K cache

Disk drives and controller: Conner CP3204/F 15-ms 212MB IDE hard disk, integrated IDE controller, dual 1 2MB/1 44MB floppy disk drive

Display: CompuAdd Express integrated video with Tseng ET4000 chip set and 1MB DRAM, CompuAdd 51110 15-inch monitor with 72-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, Close-Up 4.0

In short: The CompuAdd Express 466DX2 Scalable is a competitively priced ISA-based slimline. This system was a less than outstanding performer on our tests, but it may be acceptable for those who don't demand too much versatility from a 486DX2/66



ON READER SERVICE CARD

COMPUTERS

486DX2/66s

were excellent, placing the Comtrade in the top five on both tests.

The company's warranty covers parts for two years and labor for the lifetime of the computer, and it also includes a year of free on-site service from Nationwide. Toll-free technical support is available during office hours.—BB

Dell Computer Corp.

Dell 466DE/2

Dell Computer Corp.'s \$4,069 466DE/2 model is a small-footprint EISA-based system with a limited number of drive bays, which is the only factor that prevents it from being used as a file server. But if you want the potential data throughput of the EISA bus, the Dell makes sense as a single-user machine, especially since its components fared well under DOS and Microsoft Windows.

The computer has plenty of memory expansion (to 96MB on the motherboard) but only four drive bays. Dell Computer Corp. makes the most of the bays, however, by installing a dual 1.2MB/1.44MB floppy disk drive made by Canon into one of the externally

accessible 5.25-inch bays. The single internal 3.5-inch bay is used for the computer's Quantum 230MB IDE hard

SUITABILITY TO TASK

Dell 466DE/2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

disk with a 256K cache.

Although most components, such as the memory banks, are easy to reach, the area below the power supply is difficult to access. However, since the processor, the clock crystal, an alternate processor socket, and the external SRAM cache are on the plug-in card, upgrading would be very easy.

As is usual with Dell's cases, you can remove the cover just by turning finger screws. All six slots are 32-bit EISA slots, and only one is filled: It holds the Dell's



The Dell 466DE/2

ATI-based Windows graphics accelerator, which is on an ISA card. The ATI adapter turned in average DOS video and Graphics Winmark scores. The Dell gave its best performance on the memory test routines, where it placed second of all the machines we tested. The processor score, though not as high, was above the mean. These two scores and a DOS disk score within the top 30 percent pushed the computer's DOSmark score above the average. Its Disk Winmark score was also above-average.

Dell offers a one-year parts-and-labor warranty with free on-site service. While it can be hard for some to justify the cost of an EISA-based PC that will not be used as a file server, the Dell 466DE/2 shines.—BB

DFI Inc.

DFI 486-66DX2

The DFI 486-66DX2's relatively high list price of \$3,982 is reflected in a configuration that features a Tseng-based local-bus graphics card that has both multimedia and multiprocessor capabilities. Al-



The DFI 486-66DX2

though the DFI's video score placed among the top third, its performance on some other tests was disappointing.

The DFI system comes in an exceptionally well-built tower case that has its own support: legs, a handle, and lots of room. The processor has its own cooling fan and is mounted on a modular card, which also has a standard upgrade socket.

You can install up to 32MB of RAM on the motherboard and 16MB more on a memory expansion card. Despite the large case, the DFI holds only six drive bays.

The system came with a Western Digital 202MB hard disk and an IDE/ISA caching disk controller with a 1MB cache. This combination pushed the DFI way ahead of the competition on our DOS disk test routines, where it ranked sixth among our entire test group. Unfortunately, the disk score under Microsoft Windows was low.

The DFI's DOS and Windows video scores, which were among the top third

SUITABILITY TO TASK

DFI 486-66DX2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

FACT FILE

Dell 466DE/2

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400; fax, 800-727-8320

List price (tested configuration): \$4,069.

Memory and processor: RAM cache: 8MB 80-ns RAM, 128K cache.

Disk drives and controller: Quantum 16-mb 230MB IDE hard disk with 256K cache, integrated Dell controller, dual 1.2MB/1.44MB Canon floppy disk drive.

Display: ATI Ultra Mech 8 38800 adapter, Dell Ultra-Scan 15FS 15-inch monitor with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The Dell 466DE/2A is a quality single-user EISA-bus machine that provided solid test results under both the DOS and Microsoft Windows portions of PC Magazine Labs' benchmark tests. Since its main processor, clock crystal, external RAM cache, and alternate processor socket reside on a plug-in card, you will have an easy time performing upgrades.

ON READER SERVICE CARD



THEY MAY HAVE HEARD THE BEST
DEAL ON EARTH JUST GOT BETTER.
486 LEADERBOOK NOW \$1695.



Presenting the remarkable color and monochrome LeaderBooks. Power, speed and reliability from a company that PC World says "gives you everything you want, including

combine a full featured 82-key keyboard with a built-in, 2-button Trackball. An easy to read 9-function LCD panel displays the system status including battery life,

performance, a perfect 10 in price and the best service and support in its group.

As a result of our commitment we back each product we make with some of the most comprehensive guarantees in the industry: A 30-day, no-questions-asked money-back guarantee, one year 100% parts and labor service coverage, an unlimited toll-free phone and FAX technical support line that "Computer Reseller News" ranked among the best.

Additionally we offer an on-line in-house tech support bulletin board and service forums available on both CompuServe® and Prodigy™.

We're confident of our service because we have confidence in our products. Our reputation is on-line every day.

THEY
HAVEN'T HEARD
ANYTHING YET.

low price." Products like these have won us over a dozen patents and a reputation as a customer-driven service and support company.

POWER WITHOUT THE PRICE

The 486/SLC LeaderBooks easily run 2½ times faster than most 386SX notebooks. And with the addition of a full color VGA LCD display at 640 x 480 resolution, the whole computing experience is enhanced. That means you're more productive, even away from the office.

If the 486/SLC Color LeaderBook doesn't excite you with its 256 colors or its incredible speed, then the price certainly will. Just \$2495. The Monochrome LeaderBook model is only \$1695. Both are loaded with features.

The LeaderBooks come standard with 4MB RAM and an 80MB hard drive. And in addition, they

ports for communications, external monitor and numeric keypad.

Of course both the color and monochrome versions come with MS-DOS® 5 and Windows™ 3.1 already installed so you can use them immediately, right out of the box.

A GREAT PERFORMANCE. GUARANTEED

Quality is built in to all PC Brand computers. From the stringent evaluation of components to the bar coding of each part as a quality control procedure. In fact our "Get it right the first time" strategy prompted "PC Computing" to name two of our systems in the *Top 200 Products of 1992*. And also to award PC Brand a *Perfect 10* in



THE
LCD PANEL
DISPLAYS NINE
SYSTEM STATUS ICONS.



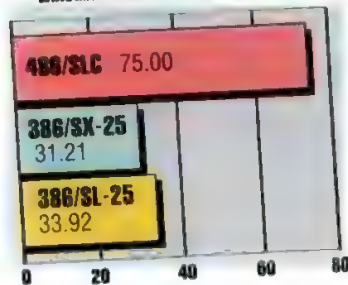
THE BEST DEAL ON EARTH

PC Brand has the engineering resources of a large international computer manufacturer. This means these resources are also available to you. We think that's the best deal on earth.



- 486/SLC processor ■ 4 MB RAM ■ 80MB drive
- Internal 1.44 MB, 3.5" drive ■ Color VGA liquid crystal display (LCD), 256 colors, 640x480

LANDMARK V2.00 PERFORMANCE TEST



resolution, 9" diagonal*

■ External VGA monitor port

■ Connector for docking station

■ 1 parallel-1 serial port ■ Dual NiCad

batteries and power adapter ■ Advanced power

management features ■ Full-size

keyboard, inverted "T" cursor layout,

12 Function keys ■ External keyboard

port ■ Built-in 2-button trackball ■ MS-

DOS® & MS Windows™ 3.1 pre-loaded

■ 8.5" x 11" x 1.73", only 5.7lbs.

■ Carrying case ■ Available options:

FAX/modem, auto adapter, spare NiCad

battery, docking

station

■ 120MB drive

available on both

the color &

monochrome

LeaderBooks

*Paper white VGA, 10" liquid crystal display, 640x480 resolution with 64 shades of gray on Monochrome LeaderBooks

NEW PRICES !

486/SLC MONOCHROME

80 MB
4 MB RAM **\$1695**

486/SLC COLOR

80 MB
4 MB RAM **\$2495**

PC BRAND™

The People's Choice.

1-800-PC BRAND

Or 1-800-722-7263 FAX 1-800-722-7392

IN MEXICO 207-9847 • IN CANADA 800-56-PC BRAND

Sales Hours M-F 7am-9pm Sat 9am-5pm Central Time
Or FAX us anytime at the number listed for our latest quotes



SPECIAL OFFER **\$999**

■ 386SX/33 processor ■ 2MB RAM ■ 105MB drive ■ 1.44 MB floppy drive ■ 16-bit SVGA ■ Color SVGA monitor(1024 x 768, .39) ■ 1 parallel/2 serial ports ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

486/SLC-33 **\$1295**

■ 486SLC-33 processor ■ 4MB RAM ■ 105MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

486/SX-25 **\$1395**

■ 486SX-25 processor ■ 64K cache ■ 4MB RAM ■ 105MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

486/DLC-40 **\$1595**

■ 486DLC-40 processor with math coprocessor ■ 64K cache ■ 4MB RAM ■ 170MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows & mouse

486/DX-33 **\$1795**

■ 486DX/33 processor ■ 64K cache ■ 4MB RAM ■ 170MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

486/DX2-50 **\$1995**

■ 486DX2-50 processor ■ 64K cache ■ 4MB RAM ■ 170MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

486/DX2-66 **\$2195**

■ 486DX2-66 processor ■ 64K cache ■ 4MB RAM ■ 170MB drive ■ 1.2MB & 1.44 MB drives ■ 16-bit SVGA with 1MB ■ Color SVGA monitor(1024 x 768, .28) ■ 1 parallel/2 serial ports ■ Upgradable processor ■ 200W power supply ■ 101-key keyboard ■ MS DOS ■ Windows and mouse

The Leader Series starts with solid engineering. Perfectly matched system integration that can only evolve from a large

dedicated engineering team. For example, a custom designed BIOS allows for ease of system control, security, support for 5 languages, ROM shadowing and full compatibility.

And that's just the beginning. Systems include a hefty hard drive and Super VGA color monitor with 1024 x 728 resolution for demanding applications. Most feature 5 expansion slots, 4 solidly built drive bays (two 5.25" and two 3.5"), upgradable processor and MS-DOS® 5 and Windows™ 3.1 pre-loaded. Solid quality with the best performance to price ratio in the industry makes the Leader Series the right choice.



PC BRAND™

The People's Choice.

1-800-PC BRAND

Or 1-800-722-7263 FAX 1-800-722-7392

IN MEXICO 207-9847 • IN CANADA 800-56-PC BRAND

Sales Hours M-F 7am-9pm Sat 9am-5pm Central Time
Or FAX us anytime at the number listed for our latest quotes

Call us for our latest special buys!

• Major credit cards, checks, money orders, direct wire and approved purchase orders accepted • Free one-year on-site service on desktop and tower systems is available to most locations in the U.S. • PC Brand reserves the right to amend specifications & prices without notifications • All non-PC Brand products and services are identified by trademarks or other service marks of their respective companies • Call for leasing options • Leasing available to qualified businesses only • © PC Brand 1992

CIRCLE 029 ON READER SERVICE CARD

COMPUTERS

486DX2/66s

FACT FILE

DFI 486-66DX2

DFI Inc., 135 Main Ave., Sacramento, CA 95838; 916-568-1234; fax, 916-568-1233

List price (tested configuration): \$3,982

Memory and processor RAM cache: 8MB 16-ns RAM, 256K cache

Disk drives and controller: Western Digital 70-ns 200MB IDE hard disk, Standard IDE controller, 1.2MB and 1.44MB floppy disk drives

Display: DFI VGA-16 VL Bus adapter, MicroScan 3E 14-inch display with 70-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The DFI 486-66DX2 has contradictory features and yielded only mixed performance scores. It scored well on PC Magazine Labs' DOS video and Windows graphics test routines, but it trailed almost the entire test group with its weak DOS memory score. A number of the other machines in this review provided better performance and superior components than the DFI, and cost less.



ON READER SERVICE CARD

of the tested machines, may be attributed to the good work of the DFI VGA-16 proprietary video card. It carries the new Tseng ET4000/W32 Windows accelerator chip, which has an internal memory management unit that lets it operate in multiprocessor environments and is optimized for Windows NT. The video card used one of the system's two VESA-VL bus slots. Unfortunately, the DFI's memory score was near bottom.

These uneven scores indicate that DFI should look at either a better configuration or improved system tuning. DFI offers a one-year parts-and-labor warranty with free on-site service.—BB

Diamond Technologies Inc.

Diamond DX2-66

Priced at \$2,995, the Diamond DX2-66 is an EISA workstation in a tower case. The Diamond achieved its best scores on the processor and memory test, though it also produced an excellent disk score under Microsoft Windows.

The Diamond's tower case offers five external drive bays (three 5.25-inch and two 3.5-inch); an additional two 3.5-inch bays are internal. The power, reset, and

turbo switches are mounted on the front. This computer's EISA motherboard has a design that is less than perfect, with controller cables blocking access to the memory banks. Still, it offered five vacant 32-bit slots, though not all could handle full-length cards. Made by OPTi, the motherboard can support 128MB of RAM. Also on the motherboard are the main pro-



The Diamond DX2-66

cessor, clock crystal, an alternate processor socket, the external cache, and the video controller. The drive controller is on an EISA card. The Diamond's keyboard has a slightly mushy feel but is acceptable.

The unit came with an excellent 15-inch CTX monitor that has handy front-panel

FACT FILE

Diamond DX2-66

Diamond Technologies Inc., 17165 Gillette Ave., Irvine, CA 92714; 800-989-7253, 714-252-1008; fax, 714-252-1508

List price (tested configuration): \$2,995

Memory and processor RAM cache: 8MB 60-ns RAM with 256K cache.

Disk drives and controller: Seagate 12-ms 245MB IDE hard disk with 128K buffer, DTC 2290 controller, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Graphics Ultra adapter with 1MB RAM, CTX 15-inch display with 72-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1

In short: Respectable performance and a mid-range price make the Diamond DX2-66 sparkle just enough to make it worth a closer look. With plenty of space for expansion, and quality internal components such as a cached disk controller, this unit can satisfy your current computing needs and still remain useful in the near future.



ON READER SERVICE CARD

buttons for image adjustment and a digital video-mode readout. The display is controlled by a microprocessor, which can store a set of preprogrammed configurations in its memory base.

The Seagate hard disk, with a 128K

SUITABILITY TO TASK

Diamond DX2-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

buffer and a DTC controller, combined to produce one of the best Disk Winmark scores of our test group. The Diamond's 256K external processor cache also performed well on the DOS processor test routines, and its ATI Graphics Ultra video adapter produced a respectable Graphics Winmark score. Other performance scores were in the middle or top half of the pack.

Diamond Technologies offers a 30-day money-back guarantee. Its warranty covers parts for 15 months and labor for two years. On-site service is available for \$75 per year.—Robert Anthony

Digital Equipment Corp.

DECpc 466d2 LP

Digital Equipment Corp.'s renewed strength in the PC market is exemplified by the \$3,124 DECpc 466d2 LP. This very reasonable price buys you a beautifully designed, well-constructed 486DX2/66 system that was a solid performer on our tests.

This slimline is part of the company's line of modular upgradable computers.



The Digital DECpc 466d2 LP

SUITABILITY TO TASK

DECpc 486d2 LP

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

The DECpc is best suited for use as a single-user machine because of limited hard disk expansion possibilities, but this computer is priced and built to sell. Storage, however, is limited to the computer's external 3.5-inch, external 5.25-inch, and two internal 3.5-inch drive bays.

The computer's construction is of a high quality, with sturdy components that fit together solidly and are easy to change. Many of the components on the Digital motherboard are integrated in such a way that the three horizontal 16-bit ISA slots are unblocked.

The DECpc uses an S3 Windows graphics accelerator on a motherboard-integrated proprietary local bus. It came to us with 1MB of video RAM, although 512K is the standard amount that Digital puts on its systems. On our test system, it produced an above-average Graphics

Winmark score; the relatively low DOS video score is characteristic of S3 chip-based accelerators. Both Digital and AST use the same 14-inch 1,024-by-768 monitor that they put their names on. The DECpc's scores on our other tests varied when compared with those of the other machines, but were generally average.

The warranty covers parts and labor for one year and includes on-site service and toll-free technical support. And while the close confines of the slimline case won't allow enough room for a series of hard disks, and therefore relegates the DECpc to single-user applications, those users will probably be happy ones.—BB

Edge Technology Inc.

Edge 466 Magnum

The old adage that good things come in small packages clearly applies to the \$3,499 Edge 466 Magnum. This small-footprint desktop PC topped the entire group of reviewed 486DX2/66s in terms of its DOS disk, Disk Winmark, and



The Edge 466 Magnum

DOSmark scores. Credit for the stellar disk performance goes to the computer's Mylex controller, which is stuffed with 8MB of RAM.

The Edge has a sleek-looking case with front-panel power and system reset buttons, as well as LED indicators for power, hard disk access, and turbo mode. The internal arrangement is compact, and a dual 1.2MB/1.44MB floppy disk drive leaves two front-accessible 5.25-inch bays open for expansion. A single screw and a couple of snap connections make it easy to remove the lid, but the drive connectors partially blocked the memory banks (which have a system maximum of 128MB, all on the mother-



FACT FILE

Edge 466 Magnum

Edge Technology Inc., 915 E. Karcher Rd.,
Nampa, ID 83687; 800-438-3343,
208-465-3434; fax, 208-465-3424

List price (tested configuration): \$3,499.

Memory and processor RAM cache: 8MB 60-ns
SIMMs, 256K cache.

Disk drives and controller: Maxtor 15-ms 213MB
SCSI hard disk with 84K buffer, Mylex DLE376 control-
ler with 8MB cache, dual 1.2MB/1.44MB floppy disk
drive.

Display: ECS/Edge VI-924 adapter with 1MB 80-ns
RAM and S3 924 chip set, 15-inch MAG Innovisions
MX15F monitor with 72-Hz refresh rate at 1,024-by-
768.

Software: DOS 5.0.

In short: Compact and well-engineered, the Edge 466
Magnum produced some of the highest scores of the
test group. Its memory, processor, and Graphics Win-
mark scores were also excellent. Only the DOS video
score was low, a characteristic of the S3 graphics ac-
celerator.



board). Five of seven 16-bit expansion slots were open, and a proprietary 32-bit local-bus slot held the video card. A Logitech Series 14 Mouse was included.

The oversized MAG Innovisions 1,280-by-1,024 monitor and the ECS/Edge video adapter produced clear and sharp screens under Microsoft Windows. The monitor has analog controls; all are on the front panel.

The Magnum's DOS disk score and DOSmark score placed first. Its memory score ranked third, while its processor and Graphics Winmark scores placed within the top 20 percent. Only its DOS video score was below-average—a characteristic of the S3 accelerator.

The Magnum is a solid, competitive package with exceptional performance. Edge offers a one-year parts-and-labor warranty and free on-site service.—RA

SUITABILITY TO TASK

Edge 466 Magnum

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	●
Expandability	●	●	●	○

FACT FILE

DECpc 486d2 LP

Digital Equipment Corp., 50 Nagog Park,
Acton, MA 01720; 800-722-9332

List price (tested configuration): \$3,124.

Memory and processor RAM cache: 8MB 70-ns
RAM, 128K cache.

Disk drives and controller: Quantum 16-ms 245MB
IDE hard disk with 256K cache, integrated controller,
1.44MB floppy disk drive.

Display: DEC local-bus adapter with S3 924 chip set
and 1MB VRAM, DEC 14-inch monitor with 70-Hz re-
fresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Digital's DECpc 486d2 LP is a beautifully
designed, well-constructed, modular system with
excellent video performance under Microsoft
Windows. While its low-profile case places tight limits
on internal expansion, the DECpc's well-integrated
motherboard allows users to make use of all of the
unit's expansion slots. A very competitive price
makes this computer worthy of your careful considera-
tion.



COMPUTERS

486DX2/66s

EPS Technologies Inc.

EPS ISA 486 DX2/66

The EPS ISA 486 DX2/66 doesn't have one of the lowest prices of our test group, but it includes some features that justify its moderate \$2,945 price tag. Your money will also buy you solid performance: The EPS produced benchmark test results that generally fell within the average.

The solidly constructed metal case has rounded corners and round buttons; the cover, held by Phillips-head screws, was



The EPS ISA 486 DX2/66

easy to remove. Inside, a tiny speaker faced one of the metal walls, which muffled the sound of the system's occasional beeps. The keyboard, which had a decent feel, was also fairly quiet to use. A three-button mouse is included with this system.

SUITABILITY TO TASK

EPS ISA 486 DX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

Inside, a small fan is mounted atop the CPU on the Contaq ISA motherboard, which holds up to 32MB of RAM. Four 16-bit and two 8-bit slots are open, although one 16-bit slot is unfortunately limited to half-length cards.

EPS Technologies sent us its own 15-inch monitor, which you can set to either a 72-Hz vertical refresh rate at 1,024-by-768 resolution or a 60-Hz refresh rate at 1,280-by-1,024 resolution. This digital monitor has its imaging controls mounted

on the front panel for easy access.

The EPS logged middle-of-the-road scores on most of PC Magazine Labs' benchmark tests. Its DOS memory and Disk Winmark scores were slightly above the mean, but the computer lagged behind the pack in terms of its other scores. Its Maxtor 340MB IDE hard disk with

FACT FILE

EPS ISA 486 DX2/66

EPS Technologies Inc., 10069 Dakota Ave.,
P.O. Box 278, Jefferson, SD 57038; 800-447-
0921, 605-966-5586; fax, 605-966-5482

List price (tested configuration): \$2,945

Memory and processor RAM cache: 8MB 70-ns
SIMMs, 256K cache.

Disk drives and controller: Maxtor M340 14-ms
340MB IDE hard disk with 256K cache with an
uncached IDE ISA controller, 1.2MB and 1.44MB floppy
disk drives.

Display: ATI Graphics Ultra adapter with ATI chip
set and 1.5MB RAM, 15-inch EPS CM-536 monitor with
60-Hz refresh rate at 1,280-by-1,024.

Software: DOS 5.0; Microsoft Windows 3.1.

In short: The EPS ISA 486 DX2/66 is a well-priced
computer with respectable but less than superb per-
formance. It managed to keep up with the competition
on all of PC Magazine Labs' benchmark tests except
for one; its DOS processor score ended up near the
bottom of the pack.



256K of cache memory provided only average DOS disk and Disk Winmark scores.

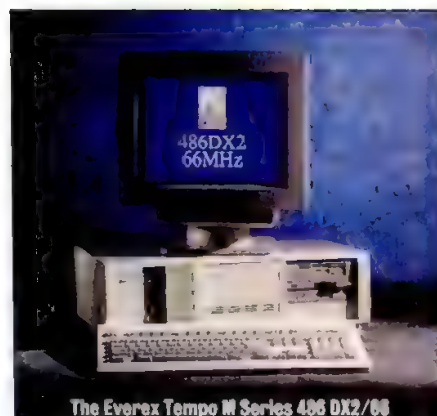
The company offers a warranty that covers parts and labor for three years; on-site service is free the first year. Toll-free technical support is available week-days.—RA

Everex Systems Inc.

Everex Tempo M Series 486 DX2/66

Priced at \$4,563, the Everex Tempo M Series 486 DX2/66 is a well-designed package that offers solid engineering. This computer's processor, memory, and DOS video scores were above the average, as was its Disk Winmark performance.

The ISA-based Tempo comes in a



The Everex Tempo M Series 486 DX2/66

large but neat metal desktop case with a well-laid-out motherboard. A Chips & Technologies disk controller fills one of the 16-bit slots, leaving six other 16-bit and one 8-bit slot open; a proprietary 32-bit slot holds the processor card. A clear plastic door covers the rabbit and turtle speed-indicator icons, as well as the power, reset, and speaker on/off buttons—a feature that came in handy when the unit was a bit on the loud side during testing.

The Everex keyboard has slightly textured keys, a tactile feel, and good key travel. The two-button Logitech mouse functioned crisply.

The NEC-built Everex monitor produced images that were somewhat fuzzy when we turned up the brightness and contrast levels, but its output was otherwise acceptable. The integrated video adapter's Graphics Winmark score was one of the lower scores produced by this test group, but the adapter redeemed itself somewhat by producing a strong DOS video score.

The Seagate 244MB IDE hard disk with its Chips & Technology controller managed only an average DOS disk score, but notched one of the top ten Disk Winmark scores. The Everex system produced an above-average memory score, but its processor score fell within the middle of the pack.

SUITABILITY TO TASK

Everex Tempo M Series 486 DX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

COMPUTERS
486DX2/66s

FACT FILE

Everex Tempo M Series
486DX2/66

Everex Systems Inc., 48431 Milbourn Dr.,
Fremont, CA 94538; 800-821-0806,
510-498-1111; fax, 510-683-2300

List price (tested configuration): \$4,563.

Memory and processor RAM cache: 8MB 70-ns RAM, 256K cache.

Disk drives and controller: Seagate ST-3283A 12-ms 244MB IDE hard disk with 128K buffer, Chips & Technologies 82C711 controller, 1.2MB and 1.44MB floppy disk drives.

Display: Everex adapter integrated on motherboard with Tseng ET4000 chip set and 1MB RAM, Everex Pro 15 15-inch display with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: This well-designed unit was a respectable performer except under Microsoft Windows graphics.

 **ON READER SERVICE CARD**

Everex Systems' warranty covers parts and labor for one year; on-site service, which is through NCS, is free the first year.—RA

Expo Tech

Expo 486 dX2/66

At \$2,799, Expo Tech's Expo 486 dX2/66 is one of the least expensive units in this roundup of 486DX2/66 computers, and it fared quite well on PC Magazine Labs' Windows test routines. In addition, the Expo also included a pleasant surprise: a modem and software to handle remote diagnostics.

The ISA-based Expo's tall tower case is amply roomy inside and has fold-out



The Expo 486 dX2/66

feet for added stability. Six of its eight 16-bit expansion slots were open, as were the two 8-bit slots.

During benchmark testing, the Expo proved itself a solid performer as a Microsoft Windows workstation. Its Seagate 245MB IDE hard disk had a 128K cache and a controller that is based on a Super I/O motherboard; the Expo notched one of the highest Disk Winmark scores of the test group, and it produced a DOS disk score that was above

SUITABILITY TO TASK

Expo 486 dX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

the average. The ATI video adapter with 1MB of RAM garnered a strong Graphics Winmark score, but the system produced a DOS video score that was slightly below the average.

The Expo's 8MB of RAM and 256K external RAM cache catapulted its processor performance, placing it among the fastest in the group. In addition, this computer's memory score was also above the average.

FACT FILE

Expo 486 dX2/66

Expo Tech, 113 McHenry Rd., Buffalo
Grove, IL 60089; 800-284-3976;
fax, 800-947-3976

List price (tested configuration): \$2,799.

Memory and processor RAM cache: 8MB 70-ns RAM, 256K cache.

Disk drives and controller: Seagate ST3283A 12-ms 245MB IDE hard disk with 128K cache, Super I/O motherboard controller, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Graphics Ultra video adapter with 1MB 70-ns RAM and Mach 8 chip set, Goldstar 1465 14-inch monitor with 87-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1, Microsoft Works for Windows 2.0, Central Point Anti-Virus for Windows, Third Degree Remote Diagnostics.

In short: This computer is a good Microsoft Windows workstation with a clever remote diagnostics feature.

 **ON READER SERVICE CARD**

An extremely helpful feature is the Expo's remote diagnostics service, which uses software from Third Degree. After a customer calls in for support, Expo Tech calls the computer (a 9,600/2,400-bps fax modem is included) and re-arranges software or reconfigures the unit's CMOS.

The warranty that Expo Tech includes with its computers covers parts and labor for one year; in addition, it includes free on-site service and support via the company's own computer bulletin board service.—RA

First Computer Systems Inc.

FCS 486-66

The \$3,999 FCS 486-66, from First Computer Systems, is a rather imposing figure with its huge tower case, but its performance on PC Magazine Labs' benchmark tests certainly didn't overshadow that of



The FCS 486-66

the rest of the field.

The FCS 486-66 has front-panel controls for power and turbo mode, came with one 1.2MB and one 1.44MB floppy disk drive, and offered seven 16-bit slots and an internal 8-bit slot. The unit also came with a three-button mouse. Writers will appreciate the keyboard, which had a crisp, tactile feel, is well built, and came with a combination dust cover/document holder.

SUITABILITY TO TASK

FCS 486-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

FACT FILE

FCS 486-66

First Computer Systems Inc., 6000 Live Oak Pkwy., #107, Norcross, GA 30093; 800-325-1911, 404-441-1911; fax, 404-441-1856

List price (tested configuration): \$3,999

Memory and processor RAM cache: 8MB 60-ns RAM, 256K cache

Disk drives and controller: Maxtor 14-ms 330MB hard disk, DPT sK2011/95 controller, 1.2MB and 1.44MB floppy disk drives

Display: Orchid Fahrenheit 1280° adapter with S3 chip set and 1MB VRAM, Optquest 15-inch display with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: First Computer Systems' FCS 486-66 is a reasonably built machine that was an adequate performer on our benchmark tests. It logged above-average DOS processor and Disk Winmark scores, but it offered below-average DOS memory and disk scores



ON READER SERVICE CARD

The 15-inch Optquest monitor offered excellent images, and its front-panel push-button controls made image adjustment an easy task. Drivers provided for the Orchid video board worked flawlessly when we switched modes within Microsoft Windows. Unfortunately, the Orchid's DOS video and Graphics Winmark scores trailed most of its competition's.

While it notched processor and Disk Winmark scores that were above the average, the FCS 486-66 produced memory and disk scores that were below the average.

The user manual was somewhat lacking in this package; it consisted of a handful of unbound loose-leaf pages. Even though it wasn't one of the top performers, the FCS 486-66 is a reasonable package at a somewhat high price. The company offers a warranty that covers parts for one year and labor for two years, along with optional on-site service.—RA

FutureTech Systems Inc.

FutureTech System 462E

After seeing the \$4,529 FutureTech System 462E, you might conclude that you're paying for size. In a way, that's true; but aside from the gargantuan case, you will

also find a SCSI-2 hard disk that propelled this EISA system's disk performance into the top echelon.

The FutureTech is a huge machine, and boxes this large generally provide easy access to the interior components. The FutureTech didn't. On the outside, the side panels, which double as doors, are not designed to open all the way. Internally, the FutureTech's huge drive bay assembly blocks access to part of the motherboard, and the processor is



The FutureTech System 462E

wedged beneath the hard disk controller.

Even with these design drawbacks, the FutureTech does have a number of good points. It has a huge number of drive bays: six front-accessible and three internal, plus a bracket on the case's floor that

FACT FILE

FutureTech System 462E

FutureTech Systems Inc., 6 Bridge St., Hackensack, NJ 07601; 800-275-4414, 201-488-4414; fax, 201-488-4405

List price (tested configuration): \$4,529.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 128K external SRAM cache.

Disk drives and controller: Fujitsu M2623FA SCSI-2 425MB hard disk with internal 256K buffer, FTS-AMI-Fast SCSI controller with 4MB cache, 1.2MB and 1.44MB floppy disk drives

Display: ATI Graphics Ultra video card with Mach 8 accelerator and 1MB of video memory, UltraScan 3E 14-inch 1,024-by-768 monitor at 70 Hz

Software: DOS 5.0, Microsoft Windows 3.1

In short: The FutureTech System 462E offers lots of space for expansion and a speedy Fujitsu hard disk. Aside from a strong showing by the hard disk, its performance on PC Magazine Labs' benchmark tests was only acceptable



ON READER SERVICE CARD

looks as if it can hold two more.

After poking around inside for a while, you will also get the feeling you're paying for the case and the hard disk, because the rest of the FutureTech's components are yesterday's news. Even

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

though all eight expansion slots are EISA-based, the video is handled by a typical 16-bit ATI adapter. Also, you'll find none of the nifty features people are asking for nowadays, such as flash-upgradable BIOS or integrated I/O ports (it seems a waste to put an 8-bit I/O card into a 32-bit slot). On the other hand, with all this interior space, the no-nonsense motherboard may be a good base for an experienced user to build a fully customized workstation. The ADI monitor was a fairly high-quality unit for a display that comes standard.

The Fujitsu 425MB SCSI hard disk performed excellently, but the FutureTech's other benchmark test scores were average. Its memory score was ever so slightly below the average. The ATI graphics adapter held its own, coming in dead average under DOS and slightly above the average under Microsoft Windows.

FutureTech Systems offers a warranty covering parts and labor for 15 months, and a \$79 charge for one year of on-site service from Computer Technology Services.—OR

Gateway 2000

Gateway 2000 4DX2-66V

The \$2,995 Gateway 2000 4DX2-66V is technologically a first-class computer. It combines VESA-compliant local-bus technology, attractive styling, and a 15-inch flat-screen monitor. Its benchmark tests scores were average or better except for its DOS and Graphics Winmark results, which were stunningly high. It was a finalist in PC Magazine's Ninth Annual Awards for Technical Excellence.

FACT FILE

Gateway 2000 4DX2-66V

Gateway 2000, 610 Gateway Dr., N. Sioux
City, SD 57049; 800-523-2000,
605-232-2000; fax, 605-232-2023

List price (tested configuration): \$2,995.

Memory and processor RAM cache: 8MB 80-nm
RAM, 64K external SRAM cache.

Disk drives and controller: Western Digital Caviar
IDE 13-ms 340MB hard disk, integrated controller,
1.2MB and 1.44MB floppy disk drives.

Display: ATI 1,024-by-768 Ultra Pro VESA-compliant
local-bus video adapter with ATI 6880 chip set and
1MB VRAM, CrystalScan 1572FS 15-inch monitor with
60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The Gateway 2000 4DX2-66V shines. It has
a VESA local bus, powerful video and storage elements,
an excellent bundled monitor, and a very attractive
price. Its strong scores on PC Magazine Labs' disk and
graphics Windows test routines make this unit a solid
choice as a Microsoft Windows workstation.

ON READER SERVICE CARD

The standard desktop case is stylish,
and with five drive bays it has plenty of
room for expansion. It did come up short
in two respects: it lacked a mouse port
and had only 64K of external cache; the
system can accommodate a maximum of
256K. The CrystalScan monitor features
a flat, square screen, and has conven-
iently positioned controls and an excel-
lent picture quality.

The major innovations in this



The Gateway 2000 4DX2-66V

Gateway PC, however, have occurred
inside the case. You'll find a total of eight
ISA expansion slots and two VESA-
compliant local-bus extensions. One ISA
slot and its VESA extension was
connected to an ATI video accelerator,

which includes anti-aliasing technology
and support for 1,280-by-1,024. The other
local-bus extension was left empty,
presumably so you can fill it with one of

SUITABILITY TO TASK

Gateway 2000 4DX2-66V

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	○

the expected VESA-approved local-bus
products, such as a hard disk controller.

The DX2/66 processor is covered by
a heat sink and resides next to an empty
486 processor expansion socket—
evidence that this motherboard was not
designed exclusively for Intel's DX2/66.

The Gateway managed slightly above-
average processor performance, and its
memory and DOS disk scores were aver-
age. In contrast, its DOS video and
Graphics Winmark scores were nothing
short of exceptional.

Gateway 2000 offers a one-year war-
ranty with a 30-day money-back guaran-
tee and toll-free technical support.—OR

GCH Systems Inc.

EasyData 486DX-2/66

Though it uses solid components, the
\$3,860 EasyData 486DX-2/66 produced
mediocre to below-average scores on our
benchmark tests.

Even though it came with a 256K ex-
ternal cache, the EasyData's memory
score was average, and its processor score
was subpar. This computer's perfor-
mance on our other tests did not improve;
its Graphics Winmark score was ex-

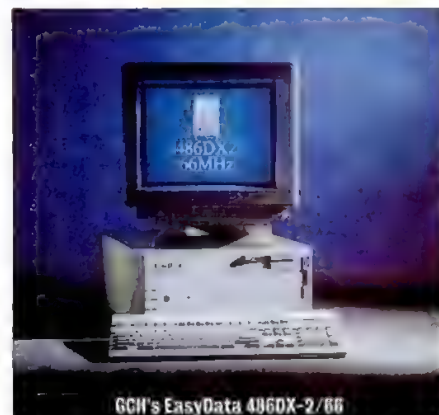
SUITABILITY TO TASK

EasyData 486DX-2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

tremely low, and its DOS video score was
the lowest of the roundup. The Easy-
Data's low Graphics Winmark score was
a little surprising, because the Actix
graphics adapter is built around an S3

GUI accelerator and contained 1MB of
video DRAM. A nice visual touch was
the 15-inch CTX monitor, which some-
what improved the value of the overall
package. The Maxtor 340MB hard disk
was larger than many of the other DX2/
66 computers we looked at for this
roundup, but was able to manage a DOS
disk and Disk Winmark scores that were



GCH's EasyData 486DX-2/66

only midrange. As a result of the low
DOS disk score, the machine's DOSmark
score was below the average.

In addition, you will find none of the
technical niceties and extras we've come
to expect and that are offered by more
competitive vendors: flash memory or
motherboard-integrated components

FACT FILE

EasyData 486DX-2/66

GCH Systems Inc., 777 E. Middlefield Rd.,
Mountain View, CA 94043; 800-366-4560,
415-968-3400; fax, 415-964-9747

List price (tested configuration): \$3,860.

Memory and processor RAM cache: 8MB 80-nm
SIMMs, 256K external SRAM cache.

Disk drives and controller: Maxtor LXT340A IDE
340MB 15-ms hard disk with internal 32K buffer, Vitax
IDE/PCs multifunction pass-through adapter, 1.2MB
and 1.44MB floppy disk drives.

Display: Actix Graphics Engine VGA adapter with S3
accelerator and 1MB of video DRAM, CTX CPS-1560
15-inch monitor with 72-Hz refresh at 1,024-by-768 res-
olution.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The EasyData 486DX-2/66 turned in below-
average performance on PC Magazine Labs' benchmark
tests. It also has unaggressive pricing and lackluster
support. Many of the other machines in this test group
might better suit your needs.

ON READER SERVICE CARD

NORTON DESKTOP
FOR WINDOWS

A \$299
Retail Value
ONLY \$119

Version 2.0

"Every Windows user should have it."
— PC Computing 12/91

Norton Desktop 2.0 for Windows adds a whole new dimension and ease of use to Microsoft Windows 3.1 with Drag-and-Drop file management, automatic backups, virus protection, diagnostics, and more!

**Special Offer
for Windows Users!**

**\$299 WORTH OF
WINDOWS SOFTWARE**

**For Only
\$119**

**Special
Norton Desktop &
Lotus 1-2-3 Bundle**

**BN1023 (3.5")
BN1025 (5.25")**

Lotus 1-2-3

Lotus 1-2-3

**Newest Release
with SmartPak!**

Lotus 1-2-3 for Windows Release 1.1 Upgrade combines Windows spreadsheet with SmartPak, a collection of all-new, just-for-Windows enhancements that let you get more done faster and easier.

WinFax PRO 3.0

WinFax

WinFax PRO 3.0

WinFax PRO 3.0 makes it easy to send, receive, and manage faxes from within Windows. Since WinFax PRO installs just like a Windows printer, you can send faxes just as easily as you print documents—directly from Windows applications. Sophisticated document management tools let you categorize faxes using detailed descriptions, keywords, and archiving capabilities. Mark up faxes with powerful annotation tools. State-of-the-art OCR technology converts incoming faxes into editable files for your word processor or spreadsheet. WinFax PRO now includes Cover Your Fax, 100 useful and attractive fax cover sheets. Or use the new Cover page Designer and create your own. Maintain Multiple phone books and create groups for easy broadcast faxing. Supports most popular Class 1, Class 2, CAS and Sendfax modems. **Publisher: Delrina Technology FX0334**

\$75

STAR TREK After Dark

★Star Trek: The Screen Saver

Beam aboard the Enterprise with Captain Kirk and Mr. Spock on a mission to prevent screen burn-in. Encounter trilling Tribbles, Klingon battlecruisers, and burrowing horta. This all new screen saver provides over 15 animated displays, password protection, System IQ and full compatibility with After Dark. **Publisher: Berkeley Systems GR5883 \$35**

★After Dark 2.0 for Windows

Save Your screen with over 40 incredible displays. Enjoy Flying Toasters, exotic fish, Swans, Multimodule and more! Also features Digital Sound, True Color Graphics, WallZapper (instantly turns an AfterDark display into Wallpaper), password protection with network password support, System IQ and DOS blanking to black. **Publisher: Berkeley Systems GR1994**

\$29

MANAGEPRO

★ManagePro for Windows

PC Magazine called ManagePro an "Excellent tool for helping you become a better manager." Easily become more organized, achieve your goals and manage your people more effectively with ManagePro's three powerful integrated tools. Finally, all your goal and people information is in one place! Plan, track and delegate goals with Goal Tools. Track progress, plan coaching and conduct reviews with People Tools. Take action with Action tools such as calendars. Enter information in simple spreadsheet-style planners. ManagePro then automatically creates: color coded goal and people status boards, timelines, action lists, calendars and reports. "Exceptionally easy to learn," **PC Week Publisher: Avantos BS7514**

\$239

Aldus Gallery Effects 1.5

Aldus Gallery Effects is a library of artistic effects that automatically transforms grayscale or color scanned photographs and other bitmap images into stunning, sophisticated works of art. Use Gallery Effects' plug-in filters directly in programs like Aldus PhotoStyler, or use the separate application. Sixteen master effects including Graphics Pen, Watercolor, Emboss, and Charcoal. Thousands of variations from each effect. A "must have" for any scanner user. **Publisher: Aldus GR6374**

Gallery Effects

\$139



**Call for
Overnight
Upgrades!**

I'm Kerry, call me at:

MicroWAREHOUSE®
1-800-367-7080

**Inquiries: 908-370-0518 Fax#: 908-905-5245
Order Toll-Free 24 Hours a Day, 7 Days a Week**

Free Micro Warehouse Catalog Subscription
1720 Oak Street, P.O. Box 3014, Lakewood, N.J. 08701-3014
Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog

Name _____

Address _____ Apt. _____

City _____ State _____ Zip _____

(Expect to receive your next issue within 4-6 weeks)

PM0193B

CIRCLE 225 ON READER SERVICE CARD

COMPUTERS

486DX2/66s

like I/O, video, or hard disk controllers. GCH Systems touts the CPU as being upgradable, but you can only upgrade it to a 486, and the version the company sent to PC Magazine Labs was already the most advanced model in the company's line.

The case contains an extra-small ISA motherboard, which was partially obscured by the drive bays and cables. Of the computer's six 16-bit slots, four were empty.

The company offers a warranty that covers parts and labor for one year. You can augment this by purchasing one year of on-site service from U.S. Net for \$99.—OR

Gecco Computers

Gecco 466E

Gecco Computers is a small computer vendor that is attempting a unique arrangement of off-the-shelf components. Its \$3,225 Gecco 466E has a decent price—considering its EISA architecture—and performed solidly on our



The Gecco 466E

benchmark tests. The Gecco system comes with a good warranty and service policy.

The company chose to send us its tower model, which may have added slightly to the price but was also a plus in terms of expansion space and the accessibility of the components. The Gecco's case comes with eight drive bays and is attractively styled. The 15-inch Taxan monitor was a little Spartan, but the rest of the package, including the documentation, showed that the company paid attention to the system's user friendliness.

The Kouwell motherboard wasn't

integrated or designed for easy CPU upgradability, but it carried all the essentials, such as an external SRAM cache and even RAM expandability up to 128MB. The motherboard's EISA architecture extended only to six of its eight

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	●

expansion slots; the other two are standard 16-bit ISA slots. Though the system lacks integrated components, and its video adapter might have been better, this computer's interior components are more than acceptable.

The Gecco's DOS disk and Disk Winmark scores were solid though unexceptional, while its processor and memory scores were both well above the average. The Gecco's other scores were average, except for its Graphics Winmark result; this is where the Orchid graphics adapter's Tseng chip set choked.

The company offers a warranty that

FACT FILE	
Gecco 466E	
<i>Gecco Computers, 1325 W. 21st St., Tempe, AZ 85282; 800-486-1000, 602-967-7500; fax, 602-967-3610</i>	
List price (tested configuration): \$3,225	
Memory and processor RAM cache: 8MB 60-ns SIMMs, 256K external cache	
Disk drives and controller: Quantum ProDrive LPS240AT 15-ms 240MB IDE hard disk with internal 256K buffer, DTC 2290 pass-through controller, 1.2MB and 1 44MB floppy disk drives	
Display: Orchid ProDesigner IIs EISA video adapter with Tseng ET4000 chip set and 1MB DRAM, Taxan MV-550 15-inch monitor with 70-Hz refresh rate at 1,024-by-768	
Software: DOS 5.0, Microsoft Windows 3.1	
In short: Gecco Computers' EISA-based Gecco 466E comes with a decent price, an acceptable design, average performance, and a solid warranty policy. While its motherboard didn't include integrated ports, the Gecco was very user friendly.	
 ON READER SERVICE CARD	

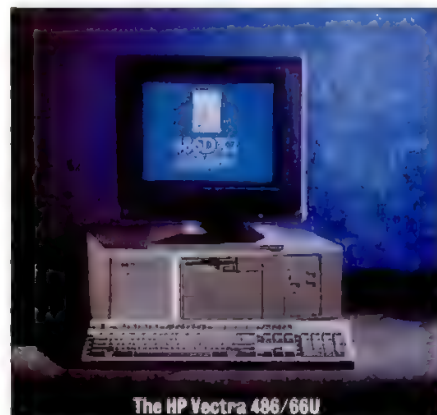
covers parts and labor for two years; this includes two years of free on-site service from Idea ServCom.—OR

Hewlett-Packard Co.

HP Vectra 486/66U

When it comes to ease of use, Hewlett-Packard Co. leaves nothing to chance. But although the \$4,545 HP Vectra 486/66U is solidly engineered, its performance fails to justify its steep price.

HP's documentation is a godsend. It has enough clear illustrations to get most users through most problems. Configur-



The HP Vectra 486/66U

ing the Vectra is easy, since you don't need tools to open the case. There is even a sticker inside, outlining how to flip the hinged hard disk so you can access the motherboard. The rear ports are labeled clearly, and a BIOS lock switch protects the programmable BIOS from viruses. You can even rotate the power switch and the HP nameplate so that you can read them right side up when the unit sits on its side.

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

The 13.5-inch HP Super VGA monitor was acceptable but small. Its brightness and contrast controls are on the front, but you will need a screwdriver or similar tool to manipulate the rear-mounted controls. The Quantum 245MB hard disk offers ample storage, but there is only a single 1.44MB floppy disk drive.

FACT FILE

HP Vectra 486/66U

Hewlett-Packard Co., 3000 Hanover St.,
Palo Alto, CA 94304; 800-752-0900

List price (tested configuration): \$4,545.

Memory and processor RAM cache: 8MB 80-ns
SIMMs, 128K external cache.

Disk drives and controller: Quantum ProDrive LPS
16-ms 245MB IDE hard disk with 256K cache, adapter
integrated onto motherboard, 1.44MB floppy disk drive.

Display: HP Ultra VGA integrated adapter with 512K
RAM and S3 chip set, Samtron HP Super VGA 13.5-
inch display with 80-MHz refresh rate at 800-by-600.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The HP Vectra 486/66U is a solidly built, well-
documented package, but its high price tag wasn't
justified by its components or performance. The HP
has a quality engineered, easy-to-open case, along
with a solid keyboard, but it notched below-average
results on PC Magazine Labs' DOS processor, DOS
video, and Disk Winmark test routines.

ON READER SERVICE CARD

HP's well-built keyboard had a mushy feel, but its large, rectangular keys and brown-on-beige lettering made it a pleasure to work with. HP also provides its own sculpted mouse, which functioned crisply. The Vectra's metal case provides front-panel controls for power, reset, and keyboard lock.

The Vectra may be solid, but it notched only average scores on PC Magazine Labs' benchmark tests, with memory, disk DOSmark, and Graphics Winmark scores that were slightly above the average. Its processor, DOS video, and Disk Winmark scores fell below the average.

HP offers a one-year parts-and-labor warranty with on-site service. Extended warranty plans are available.—RA

Hyundai Electronics America

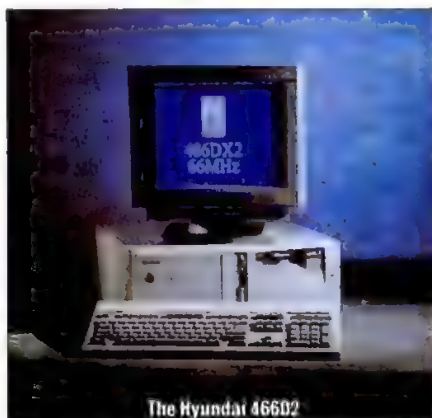
Hyundai 466D2

At \$2,721, the Hyundai 466D2 is one of the less expensive machines in this roundup. It is the last of the company's older line of PCs. With the help of a VESA-compliant local-bus card made by ATI Technologies, it turned in some ex-

ceptionally strong video performance. Other results were below the average.

This desktop features front-panel power and reset switches, indicators for power and turbo mode, and a keyboard lock. It also came with a keyboard that felt and sounded rickety, as well as a PS/2-type mouse.

Our test unit's 14-inch Hyundai monitor produced clear images but has inconveniently placed controls: Those for con-



The Hyundai 466D2

trast and brightness are on the side, and the image-sizing controls are on the rear. The ATI adapter with 1MB of RAM made good use of its VESA local-bus connection, producing the third-fastest

FACT FILE

Hyundai 466D2

Hyundai Electronics America, 166
Baypointe Pkwy., San Jose, CA 95134;
800-933-3445, 408-473-9200

List price (tested configuration): \$2,721.

Memory and processor RAM cache: 8MB 70-ns
RAM, 256K external cache.

Disk drives and controller: Conner 16-ms 212MB
IDE hard disk with 256K cache, controller integrated
on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Mach 32 1,280-by-1,024 local-bus
adapter with ATI 68800 chip set and 1MB VRAM,
Hyundai HEM 433E 14-inch monitor with 70-Hz refresh
rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The price is right, but the Hyundai 466D2's
design and performance could use some work. While
it proved to be a strong performer on our Graphics Win-
mark and DOS video test routines, its disk and memory
scores were a bit off the mark. With the proliferation
of jumpers on its motherboard, upgrading components
could be a daunting task, even for veteran PC users.

ON READER SERVICE CARD

SUITABILITY TO TASK

Hyundai 466D2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	○

Graphics Winmark score and the sixth-fastest DOS video result. The 212MB Conner IDE hard disk had its own 256K cache but logged below-average scores. Despite a 256K external cache, the Hyundai's processor and memory scores were also below the mean.

Inside, the Hyundai's unfinished-looking case showed signs of spot welding. A tall heat sink mounted atop the CPU effectively limited three of the vacant 16-bit slots to half-length cards; one slot in the tested unit lacked a rear-support bracket. Hyundai assures us that it plans to use a slimline heat sink in the future. The motherboard was laden with jumpers, making reconfiguration a chore; SIMM sockets placed below the hard disk were tough to access.

Hyundai Electronics America offers an 18-month warranty on parts and labor and one year of free on-site service if you buy direct.—RA

IBM Personal Computer Co.

IBM PS/2 Model 77 486DX2

IBM Personal Computer Co.'s \$5,415 MCA-bus entry has the potential to excel, but its lack of an external processor cache detracted from what is otherwise a solid but not head-of-the-class computer.

The IBM PS/2 Model 77 486DX2 is



The IBM PS/2 Model 77 486DX2

COMPUTERS

486DX2/66s

FACT FILE

IBM PS/2 Model 77 486DX2

IBM Personal Computer Co., Rt. 100,
Somers, NY 10589; 800-772-2227;
fax, 800-426-4329

List price (tested configuration): \$5,415

Memory and processor RAM cache: 8MB 70-ns RAM

Disk drives and controller: IBM 10-ms 400MB SCSI hard disk, integrated controller, 2.88MB floppy disk drive

Display: IBM XGA-2/A adapter with IBM XGA-2 chip set, 1MB VRAM, 14-inch IBM 9515 monitor with 75-Hz refresh rate at 1,024-by-768

Software: OS/2 2.0

In Short: The IBM PS/2 Model 77 486DX2 showed good performance on most of PC Magazine Labs' disk and video test routines, under DOS as well as under Microsoft Windows. The solidly built unit is based on the 32-bit MCA bus and provides the familiar solid and reliable keyboard that IBM has become famous for. The IBM's list price, however, is well above that of many other machines in this review—computers that offered better performance and additional features



heavy and large but solidly built. The cover came off easily by removing two large, knurled screws. Inside, the 200-watt power supply takes up about a quarter of the real estate, but the motherboard remains very accessible. Four of the five MCA slots were vacant. The PS/2 had the standard noisy, tactile, but very reliable IBM keyboard.

The unit has a front-panel power button, status lights for the hard disk and power, and a rather large lock for the cover. Although the unit gained points for having a 3.5-inch 2.88MB floppy disk drive (which can also handle 1.44MB floppy disks), it lacked a 5.25-inch floppy disk drive (the company doesn't include the latter with its PCs).

IBM made access to the CMOS setup screen unnecessarily difficult. Rear con-

nectors are labeled with generic icons. The IBM 9515 monitor was adequate but unexceptional, providing only front-panel controls for brightness and contrast. It doesn't have controls for other adjustments.

The IBM's best test score was its disk result. Its Disk Winmark score was average, but the unit's ninth-place DOS disk result helped raise its DOSmark score. And while the IBM's Graphics Winmark score was slightly below the average, its DOS video result was above the mean. Unfortunately, the lack of an external processor RAM cache caused the IBM to lag behind the other PCs, logging in one of the lowest processor scores.

IBM offers a warranty that covers parts and labor for three years.—*RA*

Insight Computers

Insight 486DX2-66I

The \$2,999 Insight 486DX2-66I has a great price. And although its benchmark test scores didn't always reflect its quality componentry, they were good enough.

The test unit held an Aten motherboard. A 256K external cache helped the Insight produce one of the fastest processor scores. This PC's memory score



The Insight 486DX2-66I

was slightly below-average. The company says that it will try to improve memory speed by using only 60-nanosecond SIMMs.

Six out of the eight expansion slots on the motherboard were open. One slot holds an uncached IDE hard disk controller card. The Fujitsu 512MB hard disk with a 64K cache yielded slightly below-average performance, reflecting the need for a cached disk controller.

The Insight's video performance was

SUITABILITY TO TASK				
Insight 486DX2-66I				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

mixed as well. While its DOS video score was way above the average, its Graphics Winmark result was poor. Offsetting this low score, however, is the STB video card's support of 24-bit color and the excellent MAG 15-inch monitor. And if you truly need Microsoft Windows graphics, you can order a GUI adapter.

Insight Computers can configure its PC to suit almost any need. It sells 37 different hard disks ranging from 40MB to 2.1GB, 6 video cards, and 16 monitors between 14 and 21 inches. For example, a basic configuration with a 200MB IDE hard disk and 14-inch Super VGA monitor sells for \$2,199.

The one-year parts-and-labor warranty does not include on-site service. An extended warranty costs 9 percent of the system price.—*Henry Fersko-Weiss*

FACT FILE

Insight 486DX2-66I

Insight Computers, 1912 W. 4th St., Tempe,
AZ 85281; 800-755-9628, 602-350-1176;
fax, 602-350-1150

List price (tested configuration): \$2,999

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K external cache

Disk drives and controller: Fujitsu M2624T 12-ms 510MB IDE hard disk with 64K cache, uncached Insight controller, 1.2MB and 1.44MB floppy disk drives

Display: STB Evolution 24-bit color adapter with 1MB VRAM, Cirrus Logic chip set, MAG MX15F 15-inch monitor, 60-Hz refresh rate at 1,280-by-1,024

Software: DOS 5.0, Microsoft Windows 3.1, Dr. Solomon's Anti-Virus Software, Stacker 2.0

In Short: The Insight 486DX2-66I comes with top-name components for a price that is one of the lowest around. You can also choose from a wide range of peripherals. Processor performance was excellent, its memory speed is being improved, and you can specify a different adapter if you want Microsoft Windows-oriented graphics



International Data Systems

IDS 466i2

Priced at \$2,949, the IDS 466i2 is a good all-around performer that stumbled only on our video test routines.

The AMI Super Voyager motherboard is well laid out, but only four expansion slots can accept full-length cards because of the placement of the two 3.5-inch drive bays. (All the drive bays—three 5.25-inch and two 3.5-inch—are external.) The hard disk circuitry is integrated onto the motherboard. One of the other four slots holds the ATI Graphics Ultra video adapter, and there is one 8-bit slot. So you may have to shift cards around a bit or purchase carefully if you decide you need to expand the system. The SIMMs on the motherboard are also too close together, making it difficult to maneuver them in and out.

But this machine, which comes with a Leaguer International mouse, shines when it comes to performance. Helped by 256K of 15-nanosecond RAM cache, the IDS blazed through our processor test routines, ranking eighth among all

the systems tested. Its memory test score placed eleventh. Disk speed was also, for the most part, quite brisk. The mother-



The IDS 466i2

board-based AMI disk controller was paired with a 362MB 12-millisecond Conner hard disk. The combination placed third on our Windows disk test. The IDS's DOS disk-speed score, however, dipped below the mean.

Although the IDS has the well-regarded ATI Graphics Ultra video card,

SUITABILITY TO TASK

IDS 466i2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

the video subsystem didn't live up to expectations, registering slightly below-average results on our Graphics Winmark test routines. Its DOS video test scores came in toward the bottom of the range. The analog monitor, which is made by Impression Plus, has an automatic vertical size control that does a good job. Brightness and contrast are also good. One drawback, however, is the lack of a horizontal size control.

International Data Systems offers a one-year parts-and-labor warranty. On-site service is available for one year from GE Computer Service for \$95.—HFW

International Instrumentation Inc.

Blue Max Monolith 486D2/66UP

Designed to deliver top graphics, the Blue Max Monolith 486D2/66UP mini-tower combines a proprietary local-bus video system with a graphics accelerator.

FACT FILE

Blue Max Monolith 486D2/66UP

International Instrumentation Inc.
2282 Townsgate Rd., Westlake Village, CA
91361; 800-543-3475, 805-495-7673;
fax, 805-379-0701

List price (tested configuration): \$2,797.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.

Disk drives and controller: Conner CP-3204/F 16-m 213MB IDE hard disk, 64K buffer; UltraStor 15C controller, 2MB cache; 1.2MB and 1.44MB drives.

Display: ATI 8514-Ultra 1024-by-768 accelerator coprocessor adapter, 1MB VRAM; Ili's 1024-by-768 adapter, Tseng ET4000, 1MB VRAM; 14-inch MAG PMV1448 monitor, 60-Hz refresh at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Ili's Blue Max Monolith offered excellent video performance on both our DOS video and Windows graphics test routines and is available at a very competitive price.

ON READER SERVICE CARD

The bottom line with this system is excellent video in both DOS and Windows.

There are two video controllers in the Blue Max, a Tseng-based local-bus card with 1MB of video RAM and an ATI 8514-Ultra accelerator coprocessor adapter, also with 1MB of video RAM. This combination catapulted the Blue Max to very near the top of our test group in DOS video performance and within the top third in Windows graphics. Only a handful of machines did better on these two benchmark tests together.

International Instrumentation has included a Z-Nix mouse as well as a 14-inch



The International Instrumentation Blue Max Monolith 486D2/66UP

FACT FILE

IDS 466i2

International Data Systems
12800 Garden Grove Blvd., Bldg. E, Garden
Grove, CA 92643; 800-952-9431,
714-530-8677; fax, 714-530-0815

List price (tested configuration): \$2,949.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K external RAM cache.

Disk drives and controller: 362MB, 12-ms Conner CP-3364 IDE hard disk with 256K buffer, uncached AMI disk controller integrated on motherboard, 1.2MB/1.44MB dual floppy disk drive.

Display: ATI Graphics Ultra video adapter with ATI Mach 8 chip set and 1MB VRAM, 14-inch Impression Plus monitor with 76-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: A good all-around performer with a good price tag, the IDS 466i2 was held back by subpar video scores.

ON READER SERVICE CARD

SUITABILITY TO TASK

Blue Max Monolith 486D2/66UP

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

MAG monitor that produces a great image. Supporting the video system is an International Instrumentation motherboard that can accept up to 128MB of RAM. The Blue Max also pairs a 213MB Conner IDE hard disk with an UltraStor controller that has a 2MB cache.

This combination produced excellent performance, ranking fourth in our test group. Processor performance was average, and the memory score dipped a bit below the mean.

The unit uses a chip-mounted heat sink with a built-in temperature sensor that is hooked up to a digital volt reader. International Instrumentation says that early next year, it will allow for display of the chip temperature to take better advantage of this sensor by keeping track of temperatures and vibrations throughout the system.

International Instrumentation offers a one-year parts-and-labor warranty, with free on-site service available for the first year.—HFW.

Keydata International Inc.

486DX2-66 KeyStation

The 486DX2-66 KeyStation EISA tower has been designed with expandability in mind. Its growth potential is bolstered by its above-average processor, memory,



The Keydata 486DX2-66 KeyStation

and Disk Winmark scores.

The front panel of the KeyStation gives you access to seven drive bays; an eighth bay is internal. A plastic door protects the accessible bays from dust. A digital speed display and large power, turbo,

FACT FILE

486DX2-66 KeyStation

Keydata International Inc., 111 Corporate Blvd., South Plainfield, NJ 07080; 800-486-480, 908-755-0350; fax, 908-756-7359

List price (tested configuration): \$3,195.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.

Disk drives and controller: Mextor MXT-340S 15-ms 345MB SCSI-2 hard disk with 32K buffer, A-SUS SC0100 controller, 1.2MB and 1.44MB floppy disk drives.

Display: Prolink NCR22E+ 1,024-by-768 adapter with and 1MB VRAM, 14-inch CTX 5488 NI monitor with 60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1, choice of: Borland Turbo C++ for Windows 3.1, Borland Turbo Pascal for Windows 1.5, GeoWorks Pro 4.0., Norton Desktop 2.0, ObjectVision for Windows 2.1, PFS:WindowsWorks 3.0, Quattro Pro for DOS 4.0, Quattro Pro for Windows 1.0, or Sidekick DOS 2.0.

In short: The unit had good processor, memory, and disk Winmark scores, making it a potential server.

ON READER SERVICE CARD

and reset buttons grace the front panel as well.

Inside this tower, good design prevails. The frame has spot-welded joints and stiffeners for extra strength. All the components and full-length expansion slots (five are unoccupied) are easy to reach. One other nod to expansion is the A-SUS motherboard, which can hold a

SUITABILITY TO TASK

486DX2-66 KeyStation

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

maximum of 128MB of RAM.

The KeyStation's best score resulted from its disk performance under Windows. Under DOS, however, the unit's score fell below the mean. Processor and memory scores were above average, but

video scores were weaker: Its DOS video score was below average, and its Graphics Winmark score approached the bottom of the range. However, if you are after a server, you generally don't need strong graphics.

The CTX 14-inch monitor, which comes with the system, has a good image but flickers at the top refresh rate of 60 Hz. However, the NCR video card can support a better monitor.

Keydata International offers an 18-month warranty on parts and labor. For the first 12 months, free on-site service is available from Wang Laboratories. Keydata International is also offering a 30-day money-back guarantee and toll-free technical support weekdays and Saturdays.—HFW

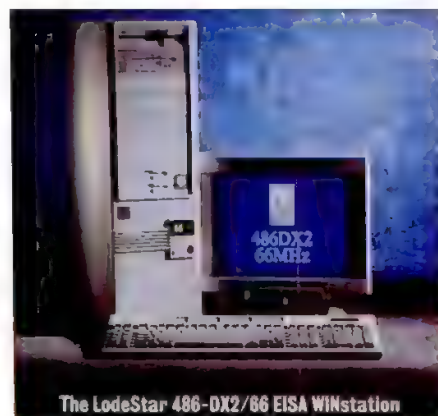
LodeStar Computer

LodeStar 486-DX2/66

EISA WINstation

The \$3,199 LodeStar 486-DX2/66 EISA WINstation combines top components with some unusual features. Its strength is mainly in disk performance, where it ranked eighth under DOS and turned in average performance under Windows.

The LodeStar motherboard is neatly



The LodeStar 486-DX2/66 EISA WINstation

laid out, making the memory and processor sockets, as well as the 32-bit expansion slots, easy to reach. One of the three occupied slots holds LodeStar's own IDE controller with 2MB of cache. LodeStar pairs it with a Western Digital 213MB hard disk, which resulted in super DOS disk performance. However, the Windows disk performance was only average.

One of the other slots on the mother-

SUITABILITY TO TASK

LodeStar 486-DX2/66 EISA WINstation

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

board holds a Diamond Stealth video adapter with 1MB of video RAM and an S3 graphics accelerator; the card is paired with an excellent 15-inch MAG monitor. The unit's Graphics Winmark score was about average; its low DOS video score was characteristic of S3 accelerator cards. Despite a 256K cache, processor and memory performance dipped below average, though you could add another 256K of RAM cache to reach the motherboard's 512K maximum.

The system comes with a particularly interesting feature: a programmable keyboard with a built-in calculator and digital display. All the controls for the LodeStar are on the front panel, along with a digital speed display. But they are placed toward the bottom of the machine,

making it awkward to reach them if the LodeStar is sitting on the floor. The unit also comes with a Z-Nix mouse.

LodeStar offers a lifetime warranty on labor and a two-year warranty on parts, with free on-site service from Nationwide Warranty Corp. for the first year.—HFW

Lightning Computers

Lightning ThunderBox

Though its name might seem a little vain-glorious, Lightning Computer's \$3,395 Lightning ThunderBox represents yet another vendor's wise decision to jump on the Micronics VL-Bus motherboard bandwagon. Our test unit used its local bus for video operation.

On the outside, the standard desktop



case and MAG MX15F monitor seem typical of a low-cost vendor. The case is large, with four external drive bays (two 5.25-inch, two 3.5-inch) and two internal 3.5-inch bays. All except the bottom 3.5-inch bay are easily accessible. There are two slots for VESA local-bus cards and six for 16-bit ISA cards, but the placement of the SIMM banks prevents using full-length cards in the last two slots.

Inside, you might be a little annoyed at first by the tangle of cables. But once you see the motherboard, which incorporates many new technical frills, you'll probably start to smile.

SUITABILITY TO TASK

Lightning ThunderBox

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	○

FACT FILE

Lightning ThunderBox

*Lightning Computers, 340 Brannan St. #200,
San Francisco, CA 94107; 800-347-4486,
415-543-3111; fax, 415-543-3532*

List price (tested configuration): \$3,395.

Memory and processor: RAM cache: 8MB 80-nS SIMMs, 256K external cache.

Disk drives and controller: Conner CP-3360 12-mS 363MB SCSI hard disk, UltraStar U34F controller, 1.2MB and 1.44MB floppy disk drives.

Display: ATI UltraPro 1,280-by-1,024 VESA-compatible local-bus adapter with Mach 32 chip set and 2MB DRAM, MAG MX15F 15-inch monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The Lightning ThunderBox combines a price that's low for an EISA system with a cutting-edge local-bus motherboard. It all adds up to a very attractive system.



ON READER SERVICE CARD

Here you'll find a flash-upgradable Phoenix BIOS, integrated I/O ports, and drive controller circuitry (though this was disabled in order to use the faster 363MB Conner CP-3360 SCSI hard disk). Like the Tri-Star system and some others reviewed here, the Lightning uses ATI's VESA-compatible Ultra Pro local-bus video card.

These components combined to give the Lightning highly competitive performance scores, especially for such a low-priced EISA-based machine. Its DOS processor score was above average, its DOS memory score was average, and the ATI's video numbers were top-notch under DOS and Windows. The Conner hard disk had a poor showing under DOS and only average results under Windows.

Lightning Computer offers an attractive two-year parts-and-labor warranty.—OR

Mega Computer Systems

Impact 486DX2/66E+

Though Mega Computer Systems' \$3,650 EISA Impact 486DX2/66E+ entry is an acceptable machine, it suffers from

FACT FILE

LodeStar 486-DX2/66 EISA WINstation

*LodeStar Computer, 18539 E. Gale Ave.,
City of Industry, CA 91748; 800-875-7568;
818-810-3818; fax, 818-810-5928*

List price (tested configuration): \$3,199.

Memory and processor: RAM cache: 8MB 80-nS SIMMs, 256K external cache.

Disk drives and controller: Western Digital Caviar 2200 14-mS 213MB IDE hard disk with 64K buffer, LodeStar Super IDE controller with 2MB of cache, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond Stealth VRAM 1,280-by-1,024 adapter with S3 chip set and 1MB VRAM, 15-inch Mag 15F monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The LodeStar 486-DX2/66 EISA WINstation comes with some quality components and an excellent warranty program; disk performance is its greatest strength.



ON READER SERVICE CARD

Microsoft BallPoint is
the only laptop mouse
that you can adjust to
four different angles.



BallPoint* mouse raises your comfort level several degrees. And its easy-to-see cursor lowers your frustration level just as much. The point being, if you use the Windows™ operating system on a laptop, BallPoint makes your work even easier. So call us at (800) 426-9400 to find out how to get one. Because next to this mouse, others are hard to handle.

Microsoft
Making it easier

© 1992 Microsoft Corporation. All rights reserved. Printed in the USA. In the 50 United States, call (800) 426-9400. Outside the 50 United States, call (206) 936-8661. Customers in Canada, call (800) 563-9048. Microsoft and BallPoint are registered trademarks and Windows is a trademark of Microsoft Corporation.



The Mega Impact 486DX2/66E+

a common small-manufacturer problem. While bigger companies such as Gateway 2000 and Zeos International turned up the high-tech heat by optimizing their DX2/66 offerings, Mega just delivers its usual fare with a higher-level processor. Yet it charges \$600 more than either Gateway or Zeos.

The Impact looks like a powerhouse in its large tower case, which allows ample room for internal expansion. You'll see the need for that room when you delve into the BCM motherboard, which is badly obscured by a maze of cables. One thing you'll notice is a processor-upgrade card, a feature that is absent in

most other DX2/66 products. Mega claims that with this proprietary card, you'll be able to upgrade to Intel's next-generation processor when it debuts.

The rest of the interior suggests Mega has some catching up to do in order to challenge the competition. For instance, only four of its seven EISA expansion slots are empty because none of the I/O or drive controller circuits are integrated.

Despite a 2MB cache on the SCSI-2 DTC hard disk controller, the Mega—which comes with a Logitech mouse—turned in a subpar Windows disk score but managed a very strong disk score un-

SUITABILITY TO TASK

Mega Impact 486DX2/66E+

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

der DOS. The processor score was below average, though the memory score was good. The ATI Graphics Ultra card in our test unit scored poorly on DOS video and average under Windows; Mega says that by the time you read this, it will ship these systems with a Graphics Ultra Pro with a Mach 8 accelerator and 2MB of RAM.

Mega ships its systems with a Logitech mouse and offers a one-year parts-and-labor warranty.—OR.

Memorex Telex Corp.

Memorex Telex 8092-66

During the course of our testing cycle, Memorex Telex Corp. lowered the price of its 8092-66 system to \$4,665. Though



The Memorex Telex 8092-66

FACT FILE

Memorex Telex 8092-66

Memorex Telex Corp., 545 E. John
Carpenter Freeway, Irving, TX 75062; 800-
944-4455, 214-444-3500; fax, 214-444-3501

List price (tested configuration): \$4,665.

Memory and processor RAM cache: 8MB 70-ns
RAM, 256K cache.

Disk drives: Maxtor 7213 15-ms 213MB IDE hard disk
with internal 32K buffer, UMC 82C862F controller, dual
1.2MB/1.44MB floppy disk drive.

Video: ATI 1024A adaptor with 1MB DRAM, 17-inch
Capetronics CDM 4331/CDS 4232 monitor with 72-Hz
refresh rate at 1,280-by-1,024.

Software: MS-DOS, Microsoft Windows 3.1.

In short: With a 14-inch monitor, the Memorex Telex
entry would cost \$3,965. Despite good components,
which include a 122-key autosensing keyboard and a
17-inch monitor that uses microprocessor-operated
controls, the unit's overall performance was weak.



ON READER SERVICE CARD

the price is high relative to some of the lower-end machines, it includes an excellent 17-inch monitor. Ordering the less-expensive 14-inch monitor would take \$700 off, bringing the price to \$3,965. Yet the Memorex Telex offering remains a standard ISA-based product that delivered disappointing performance.

The 17-inch Capetronics monitor is a particularly nice one, offering an excellent picture and easy-to-use button controls. Behind the buttons, the technology at work is a digital microprocessor that controls the alignment. Customized video modes are available in the video BIOS, and the 72-Hz refresh rate at 1,280-by-1,024 noninterlaced resolution is very good indeed.

The Memorex Telex 8092-66 includes many niceties, such as an easy-to-open small-footprint case with convenient access to all interior components and an autosensing 122-key keyboard. Essential components are mounted on the motherboard. But while this is a good policy for interfaces such as the I/O ports and drive controllers, it is merely an adequate one for the processor and external static-RAM cache.

Despite the good componentry, the

FACT FILE

Mega Impact 486DX2/66E+

Mega Computer Systems, 10840 Thornmint
Rd., San Diego, CA 92127; 800-338-6628,
619-487-8888; fax, 619-485-1518

List price (tested configuration): \$3,650.

Memory and processor RAM cache: 8MB 80-ns
RAM, 256K external cache.

Disk drives and controller: Maxtor LXT340S 13-ms
340MB SCSI-2 hard disk, DTC 3290AS controller with
2MB cache, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Graphics Ultra adapter with ATI Mach
8 chip set and 1MB VRAM, 15-inch Amazing CM-
8428-MX analog monitor with 60-Hz refresh rate at
1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The Mega Impact comes at a moderate price,
ships its systems with a Logitech mouse, and yielded
above-average performance on our DOS memory and
DOS disk test routines, leading to an above-average
overall DOSmark score. The other test scores, however,
fell below the mean.



ON READER SERVICE CARD

GOLDEN RETRIEVER.



Since 1983, Norton Utilities has been rewarded for being the best data recovery utility. Come 1992, it's still fetching top honors for superior performance.

No one retrieves data like Norton Utilities.

There's a reason why Norton Utilities has won more awards than any other data recovery program. Because no one else recovers lost data, and enhances hard disk performance for its loyal owners quite like it.

So, it's no wonder that Norton Utilities emerged as the top dog in the recent ComputerWorld awards, including top honors for best price and performance; best technology; and best service & support.

Which are all good reasons why a 1992 survey by Computer Intelligence found that more people use Norton Utilities than any other utility. Including over 80 percent of all Fortune 500 companies.

So don't wait for disaster to strike. Add the proven safety and speed of Norton Utilities today. For retrieving your valuable data, it's definitely man's best friend.

Switch now for only \$59.*

If you own PC Tools, you can upgrade to Norton Utilities now for just \$59. Just call to order, or send in this coupon along with the title page of your manual before 1/31/93. Or call: **1-800-343-4714, ext. AF14.**

NAME (PLEASE PRINT) _____

COMPANY _____

PHONE _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

☐ Check enclosed

☐ VISA

☐ MasterCard

☐ AMEX

Name as it appears on your card _____

Acct# _____

Exp Date _____

Disk size: ☐ 5 1/4 ☐ 3 1/2

\$59+\$8 (shipping and handling) \$ _____ Total _____

Send to: Symantec Fulfillment Center

Attn: Norton Utilities Offer

P.O. Box 5224, Englewood, CO 80155-5224

Limit 1 upgrade per customer
Please allow 2 weeks for delivery



*Offer valid for current owners of PC Tools and expires 1/31/93. Price in U.S. dollars. Valid in U.S. and Canada only. In Canada, call 1-800-465-2266. In Europe, call 31-71-353111. In Australia, call 612-879-6577. Everywhere else, call 408-252-3570. For a FAX Data Sheet, call 1-800-554-4403, select option 1, request document #440. Norton Utilities is a registered trademark of Symantec Corporation. © 1992 Symantec Corporation

CIRCLE 264 ON READER SERVICE CARD

SYMANTEC.

SUITABILITY TO TASK

Memorex Telex 8092-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

unit's performance on PC Labs' benchmark tests was disappointing. The Memorex Telex 8092-66 registered below-average scores in every testing area, with DOS memory and Windows graphics performance tending to land toward the lower part of the range.

Memorex Telex offers a one-year warranty on parts and labor that includes free next-business-day service. Rather than contracting with a third party, Memorex Telex handles its own on-site service.—OR

Micro Express

ME 486-Local Bus/DX2/66

Micro Express's \$3,599 ME 486-Local Bus/DX2/66 combines positive performance, competitive features, and few annoyances. And only one annoyance is major: poor layout, which can hinder changing components. You'll grit your teeth when opening or closing this mini-tower. To install external drives, you must pop off the front faceplate; to get to the Weitek coprocessor socket, you have to remove the entire drive bay assembly. On the plus side, you've got plenty of bays: there are five external bays, one internal bay, and a mounting bracket for a second internal bay.

The motherboard is crowded but serviceable. Its processor is mounted in a



The Micro Express ME 486-Local Bus/DX2/66

large ZIF (zero-insertion-force) socket that looks as if it could hold Intel's next-generation processor. Recently, Micro Express has started shipping its systems with clip-on fans for cooling the CPU. The Ergon proprietary local-bus video adapter uses the DOS-oriented Tseng ET4000 chip set. In addition, our test unit included a very nice 16-inch Nanao 7080U monitor. A disk controller with a 512K cache drives a 240MB Quantum hard disk; the IDE circuitry is integrated on the motherboard, which is also made

SUITABILITY TO TASK

ME 486-Local Bus/DX2/66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

for Micro Express by Ergon.

Memory scores were the only surprises, dipping well below average. The Tseng-based video subsystem turned in its usual high DOS video score but registered low Windows graphics numbers—a characteristic we've seen before. On our test unit, Micro Express installed an

FACT FILE

ME 486-Local Bus/DX2/66

Micro Express, 1801 Carnegie Ave., Santa Ana, CA 92705; 800-989-9900, 714-852-1400; fax, 714-852-1225

List price (tested configuration): \$3,599.

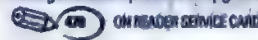
Memory and processor: RAM cache: 8MB, 80-ns SIMMs, 256K external SRAM cache.

Disk drives and controller: Quantum LPS 240AT 15-mb 240MB IDE hard disk with a 256K internal buffer, Micro Express IDE/Cache controller with 512K cache, 1.2MB and 1.44MB floppy disk drives.

Display: Ergon 1,024-by-768 local-bus video with Tseng ET4000 chip set and 1MB RAM, 16-inch Nanao 7080U monitor with 70-Hz refresh rate at 1,024-by-768 noninterlaced resolution.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: This Micro Express package offers solid performance and a good monitor display for a decent price. A large ZIF-type processor socket appears to anticipate next-generation processor upgrades.



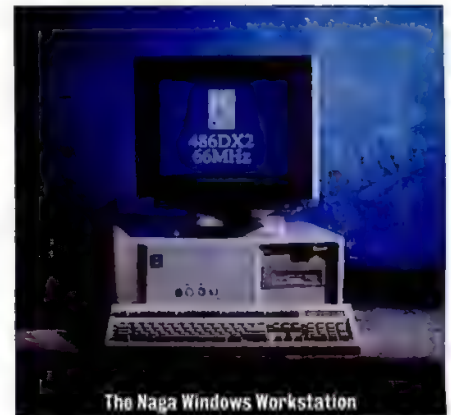
IDE/Cache disk controller that the company designs and makes; it performed well on both of our disk test routines.

Micro Express offers a two-year parts-and-labor warranty, with on-site service from GE Computer Service available in the Pacific Northwest for \$50 a year.—OR

Naga Systems Corp.

Naga Windows Workstation

The ISA-based Naga Windows Workstation, which carries a price tag of \$3,195, is miscast as a Windows-specific PC. The Naga system was an average performer in DOS, but it was disappointing in terms of Windows performance. There is nothing of inherently low-quality in the unit's components; it's just that such a collection of standard clone parts could have come at a lower price.



The Naga Windows Workstation

The motherboard certainly wasn't designed with the case in mind, since most of the drive bay assembly must be removed to gain full access—especially to the system's CPU jumper switches. The high point is the 340MB Maxtor SCSI-2 hard disk, but this is hooked to an Always controller—a component by a decidedly lesser-known controller manufacturer. And while Genoa Systems may be a familiar name in video adapters, the Tseng ET4000 chip set it uses is a disap-

SUITABILITY TO TASK

Naga Windows Workstation

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

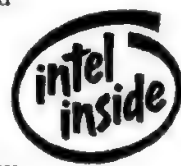
Trade memories with your friends.



Memories.

Remember the time you borrowed the company laptop and couldn't find the files you left in the hard drive? Or the time you needed to get at some data in the hard drive when someone had the computer on the road?

Aurum's new 486 notebook computer — *with interchangeable 2.5" hard drives* — will make such unpleasant memories a thing of the past. Because now each of the notebook's users can have a 60, 80, or 130 MB hard drive of their very own. Not only is data security enhanced, but the hard drives can be connected to any of our powerful desktop systems so data is available even if the notebook isn't.



You may be unfamiliar with the Aurum name, but you are familiar with Aurum products. Since 1980, we have designed and built literally hundreds of thousands of computers for leading companies in over 50 countries throughout the world.

\$1,995

- Intel 486TM SX/25 with 8KB cache
- 4 MB RAM expandable to 16 MB
- 80 MB drive; 6.3 lbs. total wt.
- Advance Power Management for longer battery life
- External keyboard & 100 pin ports
- 640 x 480 VGA LCD Display
- Windows 3.1 and DOS 5.0
- Additional disk drives:
80 MB \$399, 130 MB \$499



Call us right now at **800-55-AURUM** and order a notebook and some hard drives that you can exchange with your friends. Because Aurum's price, performance, service and support are the finest in recent memories. **800-55-AURUM**



pointment. But even though the Merchandise Promotion Co. that makes the unit's Sunshine monitor isn't exactly famous, the monitor offers some interesting features. It can read the frequency coming from the video card and automatically adjust. It can actually scan and lock on to a signal instead of jumping to preset frequencies.

Overall, the Naga's performance was average. While its DOS processor score was a little low and its DOS memory

***The Flash system
packed a noticeable
punch with its
disk scores.***

score a little above average, the rest of the components performed on par. One wonders why Naga touts this system as a Windows workstation yet uses a DOS-oriented chip set known for dismal Windows scores. The Naga logged one of the lowest Windows graphics scores in this review group.

FACT FILE

Naga Windows Workstation

Naga Systems Corp., 1520 West Mineral Rd.,
Tempe, AZ 85283; 800-964-3939;
602-820-3294; fax, 602-820-3153

List price (tested configuration): \$3,195

Memory and processor RAM cache: 8MB 70-ns RAM, 128K cache.

Disk drives and controller: Maxtor 15-ms LXT340SY SCSI-2 hard disk, ALWAYS IN-2000 controller, 1.2MB and 1 44MB floppy disk drives.

Display: Genoa Systems 7900 video adapter with Tseng ET4000 chip set and 1MB video RAM, 15-inch Merchandise Promotion Co. Sunshine analog monitor with 70-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, Norton Desktop for Windows 2.0

In short: Although the Naga gave a weak Graphics Winmark performance for a Windows-oriented workstation, its monitor can scan and lock on to a signal coming from the video card instead of jumping to preset frequencies. Its other test scores were average



Naga offers a two-year parts and lifetime labor warranty with the Naga Windows Workstation, along with free on-site service for the first year.—OR

National Microsystems Inc.

Flash 486DX2-66E

At \$3,999, National Microsystems' powerful and nicely assembled PC has all the latest goodies, including a cached EISA SCSI-2 disk controller and local-bus video. But the Flash 486DX2-66E still suffers from a few design and performance flaws.

NMS used a standard tower case to the unit's advantage, providing easy access to all internal system components. Only the top-most, internal, 3.5-inch, half-height drive bay is difficult to reach because of an interfering metal support brace. Proprietary local-bus technology is confined to one slot that doubles as a standard



EISA slot and is occupied by the AView2L S3-based graphics accelerator. Though the Advanced Integration Research motherboard offers all the standard features, it lacks the elegant touches—such as integrated I/O ports and drive controller circuits, a flash-upgradable BIOS, and an upward upgradable CPU path—now popular in many competing systems.

Nevertheless, the Flash system—

SUITABILITY TO TASK

Flash 486DX2-66E

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	●	○

FACT FILE

Flash 486DX2-66E

National Microsystems Inc., 2979-B Pacific
Dr., Norcross, GA 30071; 800-6427649,
404-446-0520; fax, 404-449-5297

List price (tested configuration): \$3,999

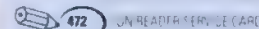
Memory and processor RAM cache: 8MB 60-ns SIMMs, 256K external cache

Disk drives and controller: Fujitsu M2622FA 12-ms 312MB SCSI-2 hard disk with internal 256K buffer, AMI EISA Fast Disk SCSI controller with 4MB disk cache, 1.2MB and 1 44MB floppy disk drives

Display: AView2L local-bus 1,280 by 1,024 graphics accelerator with an S3 chip set and 1MB VRAM, 13.5-inch CTX CPS-1560 ProScan monitor with 60-Hz refresh rate at 1,024 by 768

Software: DOS 5.0, Microsoft Windows 3.1

In short: A competitive EISA-based system, the Flash turned in some first-rate disk scores under both DOS and Windows. Components include a cached EISA SCSI-2 disk controller and local-bus video



which comes with a Z-Nix mouse—packed a noticeable performance punch with its disk scores, placing fourth under Windows and seventh under DOS. The latter mark contributed to its high overall DOSmark score. The Flash also managed an above-average Graphics Winmark test score. But it dipped below average on DOS video performance, with which the S3 chip has always had trouble regardless of local-bus technology. While the unit's processor score was average, its memory score showed a slight weakness, suggesting some faulty engineering decisions since all the hardware requirements for power performance were there.

The NMS warranty covers 15 months on parts and two years on labor. On-site service from GE Computer Service costs \$50 a year.—OR

NCR Corp.

NCR System 3350

Unless you require a lot of expansion cards, you'll find the \$4,600 NCR System 3350 to be a winning design. Though the price is high, it contains some high-level components and features, such as a

COMPUTERS

486DX2/66s



340MB SCSI-2 Maxtor hard disk and a large amount of motherboard RAM.

NCR's small-footprint case houses four drive bays—two external, two internal. All are 3.5-inch bays except for one 5.25-inch bay that can double as a 3.5-inch bay. The interior provides enough space to make the motherboard fairly accessible, but you'll have to remove the drive bay assembly for complete freedom. The high-quality monitor offers an excellent picture and acceptable ergonomics. But our test unit had only one 1.44MB floppy disk drive; for the money, you should expect more.

Inside, NCR's MCA motherboard has

FACT FILE

NCR System 3350

NCR Corp., 1700 S. Patterson Blvd.,
Dayton, OH 45479; 800-225-5627,
513-445-5000

List price (tested configuration): \$4,600

Memory and processor RAM cache: 8MB 70-ns
SIMMs, 128K external SRAM cache

Disk drives and controller: Maxtor LXT340SY 16-
ms 340MB SCSI-2 hard disk with internal 128K buffer,
NCR 53C94 integrated SCSI controller, 1.44MB floppy
disk drive

Display: NCR Super VGA adapter with NCR 77C22E
chip set and 1MB DRAM, NCR Q271 display with 60-
Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1

In short: Another solid system from NCR, this unit
fared remarkably well on our benchmark tests, man-
aging a first place memory test score and above-aver-
age DOS video and Disk Winmark test scores. The unit's
relatively high price covers some state-of-the-art
components

ON READER SERVICE CARD

an upgradable processor design with the 486DX2/55 chip on a daughterboard that plugs into a 32-bit proprietary slot. This card also holds the clock oscillator and the external static-RAM cache; another 32-bit slot remains open. The motherboard is laid out entirely in VLSIs, and you can expand motherboard RAM to a massive 192MB. The rest of the system is typical, with integrated video and I/O ports. Though there is only one serial and one parallel port, the former is 25-pin; with an adapter, it can function as a second parallel port.

SUITABILITY TO TASK				
NCR System 3350				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

Performance was generally solid. The NCR's DOS memory test score placed first among all tested machines, despite the unit's use of only a 128K cache and 70-nanosecond dynamic-RAM memory. It also managed above-average DOS video and Disk Winmark test results. Its only low mark was in Graphics Winmark performance.

NCR offers a two-year warranty on parts and labor and free on-site service for the first year.—OR

NEC Technologies Inc.

NEC Express DX2/66e

About 90 percent of this NEC system is right on the money. But, in a way, that's what's wrong with it. At \$4,599, the NEC Express DX2/66e is one of the pricier systems here. And even though it's a well-designed EISA-based PC with NEC's usual top-notch monitor and a huge SCSI-2 hard disk, it suffers from some design mistakes that managed to affect its performance on our benchmark tests.

This standard-size desktop, which comes with a Logitech mouse, bears NEC's distinct mark in its internal layout: Any of the drives mounted in the unit can be easily removed by pressing tabs and sliding them out. Also, the power supply is elongated and moved to the right side of the case. From there, both the power

FACT FILE

NEC Express DX2/66e

NEC Technologies Inc., 1414 Massachusetts
Ave., Boxborough, MA 01719;
800-388-8888, 508-264-8000;
fax, 508-264-8673

List price (tested configuration): \$4,599

Memory and processor RAM cache: 8MB 80-ns
SIMMs, 128K cache

Disk drives and controller: Maxtor LXT535SY 12-
ms 535MB SCSI-2 hard disk with internal 64K buffer,
NEC EISA Series SCSI controller, 1.44MB floppy
disk drive

Display: NEC Express Series integrated video with
Tseng ET4000 chip set and 1MB RAM, 15-inch NEC
MultiSync 4FG monitor with 72-Hz refresh rate at
1,280-by-1,024.

Software: DOS 5.0, Microsoft Windows 3.1

In short: With a massive SCSI-2 hard drive and NEC's
great monitor, this system contains a lot to like. But
performance problems and a high price tag may keep
some buyers away

ON READER SERVICE CARD

supply and the drive-bay assembly can be easily removed. Furthermore, the processor is on an easily upgradable plug-in card that is solidly mounted with two extra screws. Also on the processor card, however, is the first of NEC's design shortcomings: a secondary processor RAM cache that can accommodate only 128K. Among the integrated components (which include I/O ports, a drive controller, and a flash-upgradable BIOS), you'll find the second problem: NEC's choice of Tseng Laboratories' ET4000 as its integrated video chip set.

While the DOS-oriented Tseng chip



SUITABILITY TO TASK

NEC Express DX2/66e

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	●	○

set did well on our DOS video test routines, its Graphics Winmark test score didn't measure up. The NEC's processor and memory scores were well below the norm, and its Windows graphics performance was also below average. Performance scores for the 535MB SCSI-2 hard disk were the worst in the test group under DOS but quite good under Windows.

NEC's warranty policy—a year on parts and labor, with a year of free on-site service—is good but not outstanding, considering the unit's price.—OR

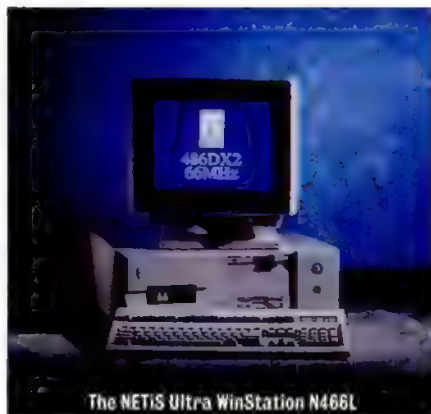
NETiS Technology Inc.

NETiS Ultra WinStation N466L

Upon examination, you will find that the \$2,300 NETiS Ultra WinStation N466L is a typical low-cost machine with propri-

etary local-bus video and a caching disk controller added to the package for better performance.

The standard desktop case contains three drive bays (two external) and NETiS's own motherboard. However, nearly every part of the motherboard you may want to reach—SIMM banks, the CPU, and system jumper switches—is difficult to access. Each is either concealed beneath the drive-bay assembly or crowded between expansion cards, buried beneath mazes of cables. If you do manage to forage as far as the SIMM banks, note that they can be upgraded to



a hefty 128MB on the motherboard.

Technically, this ISA-based computer does offer several extras, such as a secondary static-RAM cache, a Promise Technology cached IDE controller, and NETiS's own VGA-ET4000LB local-bus video card. But the proprietary local-bus video card is very close to the heat sink that dissipates heat from the CPU; this may cause the chips on the video card to heat up to unacceptable levels. Also, it seems strange that NETiS chose to name this computer with Windows applications in mind, yet equipped it with a DOS-ori-

SUITABILITY TO TASK

NETiS Ultra WinStation N466L

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

ented Tseng video chip set that is known for its dismal Windows performance.

DOS performance, though, was fairly good, with the exception of a slightly below-average memory score. Windows scores were disappointing for both graph-

ics and the hard disk.

NETiS offers a one-year parts-and-labor warranty, with an \$80 charge for a year of on-site service from Nationwide Warranty Corp. Even if price is your main concern, compare this one closely with the competition before making a purchasing decision.—OR

Northgate Computer Systems Inc.

Northgate SlimLine ZXP

Northgate Computer Systems may want to rethink a few aspects of this version of its SlimLine series. Though the Northgate SlimLine ZXP's \$3,197 price tag is attractive, it's not the best here, particularly for a system that lacks an external processor cache. On the plus side, however, the Northgate SlimLine ZXP uses local-bus video.

The Northgate has a virtual cache system that uses write-buffer technology. But this does not effectively substitute for an external static-RAM cache, which is critical to a DX2-based system performance. Its absence resulted in poor marks on our processor test routines.

Northgate's service policy declares

FACT FILE

Northgate SlimLine ZXP

Northgate Computer Systems Inc., 7075 Flying Cloud Dr., Eden Prairie, MN 55344;
800-548-1993, 612-943-8181;
fax, 612-943-6965

List price (tested configuration): \$3,197.

Memory and processor RAM cache: 8MB 70-nm SIMMs.

Disk drives and controller: Seagate ST3282A 12-ms 245MB IDE hard disk with internal 128K buffer, Northgate integrated controller, dual 1.2MB/1.44MB floppy disk drive.

Display: Integrated local-bus video with Headland chip set and 1MB DRAM, Panasonic PanaSync C1395 14-inch monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The lack of a secondary processor cache hurt the Northgate's processor performance. The system also failed to distinguish itself on the rest of our benchmark tests.

ON READER SERVICE CARD

FACT FILE

NETiS Ultra WinStation N466L

NETiS Technology Inc., 1606 Centre Points Dr., Milpitas, CA 95035; 408-263-0368;
fax, 408-263-4624

List price (tested configuration): \$2,300.

Memory and processor RAM cache: 8MB 70-nm SIMMs, 256K cache.

Disk drives and controller: Maxtor 7213A 15-ms 213MB IDE hard disk with internal 64K buffer, Promise Technology DC93 caching IDE controller with 2MB cache, 1.2MB and 1.44MB TEAC floppy disk drives.

Display: NETiS VGA-ET4000LB proprietary local-bus adapter with Tseng Labs ET4000AX chip set and 1MB DRAM, 14-inch ViewSonic 6 monitor with 60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: NETiS has constructed a decent, low-cost product that includes a few advanced components, which produces a system that performs competitively under DOS.

ON READER SERVICE CARD



The Northgate SlimLine ZXP

that customers need never delve beneath the hood of a system because the company will send someone out to do it for them. Unfortunately, this only applies to repairs. If you want to add an expansion

Occidental, a sister company to Zeos, produces value-line computers and uses its own motherboard.

card, you're still stuck digging out your Phillips head and parting a mess of cramped cables. Also, as with most slim-line cases, the expansion slots are mounted on a T-bracket that is perpendicular to the rest of the system board; this isn't the sturdiest way to hold cards, so be careful. At least all the necessities—including a full complement of I/O ports, a drive controller, and the Headland-based local-bus video chip set—are integrated on the motherboard.

Processor performance lagged behind the others in the group, mainly because of its lack of a secondary processor cache. Memory and DOS disk test results were well below average as well, but the DOS video score was a little above average. The Northgate fared better under Windows, with average graphics marks and

above-average disk scores.

Northgate supports the system with a one-year parts-and-labor warranty and free on-site service for one year.—*OR*

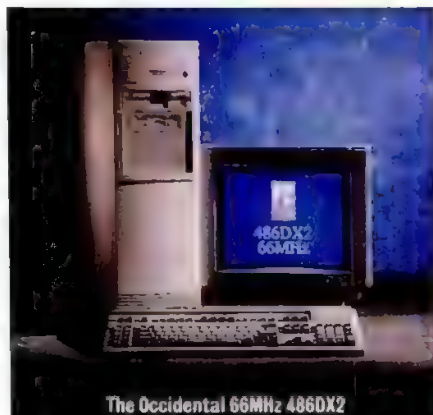
Occidental Systems Inc.

Occidental 66MHz 486DX2

Although the \$2,895 Occidental 66MHz 486DX2 has a VESA local bus, an integrated motherboard, and quality components, some of its test scores were disappointing. A few changes, however, would improve performance and still keep the price relatively low.

Occidental Systems, a sister company to Zeos International that produces value-line computers, uses its own motherboard. The one installed in our test unit had several tracers but was otherwise neatly laid out. Occidental tells us that it eliminated the tracers after the first production run.

The case holds ten drive bays. Occidental's motherboard integrates the ports, IDE disk controller, and local-bus video. This leaves all eight expansion slots empty. But two of these, blocked by the heat sink on the ZIF-mounted processor, can only accept half-length cards.



The Occidental 66MHz 486DX2

A VESA extension on one of the 16-bit slots accepts a local-bus card, so adding a local-bus disk controller gives you full local-bus operation.

The Occidental, which comes with a Logitech mouse, was only able to produce below-average processor and memory test scores; adding a 128K cache (the system's maximum) would improve upon these results. While the Occidental's disk score was average under Windows, it was low under DOS. Although the 245MB Seagate drive is rated at 12 milliseconds

FACT FILE

Occidental 66MHz 486DX2

Occidental Systems Inc., 3771
Lexington Ave. N., St. Paul, MN 55126;
800-525-6543, 612-486-0020;
fax, 612-486-0019

List price (tested configuration): \$2,895.

Memory and processor RAM cache: 8MB 60-ns SIMM; no processor RAM cache.

Disk drives and controller: Seagate ST3283A 12-ms 245MB IDE hard disk with 128K buffer, Occidental controller; integrated on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: Occidental/NCR local-bus adapter with 1MB DRAM, 15-inch CTX CPS-1580 monitor, with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0; Microsoft Windows 3.1.

In short: The Occidental's performance spanned a wide scope, ranging from above average to below average. But adding some extra-cost options would probably improve its test scores considerably. Local-bus video is integrated on the motherboard, and a VESA local-bus slot extension would let you add a local-bus disk controller.



ON HEADLINE SERVICE CARD

and has a 128K buffer, its performance was slow. Video performance ranked above average under DOS and close to average under Windows. If you want better Windows graphics performance, Occidental sells a \$299 high-end local-bus

SUITABILITY TO TASK

Occidental 66MHz 486DX2

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	●	○

video card.

Occidental's warranty covers a year on parts and labor; on-site service for the system costs \$39 for the first year.—*HFW*

Osicom Technologies Inc.

Osicom i466 MOD 420

The \$3,795 Osicom i466 MOD 420 ISA desktop is thoughtfully designed and has some excellent components. Among them is a 420MB Fujitsu hard disk (one of the test's largest) and turned in above-

SUITABILITY TO TASK

Northgate SlimLine ZXP

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

average disk performance. The Osicom's other scores, however, were in the average range or somewhat below.

The i466, which comes with an Osicom mouse, has a nicely styled case. The turbo, reset, and power switches are in a slightly recessed section on the front,



making them easily accessible yet hard to press accidentally. Four drive bays are also accessible from the front. The careful design shows on the inside as well. Here, one more drive bay is tucked under the 200-watt power supply. Its wires are tied out of the way, and all the expansion slots are unimpeded.

One of the slots holds an Osicom IDE

disk drive controller connected to a 12-millisecond Fujitsu 420MB hard disk. This combination gave the i466 its best performance ranking, placing it in the top

SUITABILITY TO TASK

Osicom i466 MOD 420

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

25 percent in both DOS and Windows disk performance. Although the processor and memory scores were near the bottom of our test range, they could easily be improved by increasing the 64K of RAM cache to 128K (a cost of \$30 more) or 256K (a cost of \$90 more).

The Osicom video card turned in an average Windows graphics score; its low DOS video score was characteristic of S3-based graphics accelerators. Matched to the video card was an excellent 15-inch Samsung monitor with a 70-Hz refresh rate at 1,024-by-768.

Osicom offers a one-year warranty, a 30-day money-back guarantee, and on-site service from Phoenix Technologies, which can be extended for up to three years. Toll-free technical support is available weekdays and Saturdays.—HFW

PC Brand Inc.

Leader Cache 486/DX2-66

PC Brand has pared its Leader Cache 486/DX2-66 desktop down considerably in order to achieve a low price. The \$2,545 price tag suggests the effort succeeded. Benchmark test results ranged from excellent processor and memory



FACT FILE

Leader Cache 486/DX2-66

PC Brand Inc., 405 Science Dr., Moorpark, CA 93021; 800-722-7263, 805-378-7848; fax, 805-378-7801

List price (tested configuration): \$2,545.

Memory and processor RAM cache: 8MB 70-nS SIMMs, 64K cache.

Disk drives and controller: Conner CP-30174E 17-ms 170MB IDE hard disk with 64K buffer, PC Brand controller integrated on motherboard, 1.2MB and 1.44MB floppy disk drives.

Display: PC Brand adapter integrated on motherboard with Western Digital chip set and 1MB VRAM, 14-inch SuperCom SV1485 monitor with 72-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: This unit has a good price, but cost-cutting efforts have trimmed the configuration down to the minimum number of components needed to support this processor level. It managed a top memory score, and processor performance was also very good.

ON-READER SERVICE CARD

scores to average DOS video scores to near-bottom disk scores.

PC Brand uses its own motherboard; the one in our test unit had some 50 jumpers. These jumpers let you upgrade from a variety of processors, reconfigure the cache, and enable or disable peripherals that originate on the motherboard. The

SUITABILITY TO TASK

PC Brand Leader Cache 486/DX2-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

Leader Cache's I/O ports, IDE circuitry, and video adapter are all integrated on the motherboard. But the jumpers make the setup procedure needlessly complex and would cause serious problems if any were bent or broken.

Another way that PC Brand kept the price down was by installing the minimum number of components needed to support a computer at this processor level. For example, while the mother-

FACT FILE

Osicom i466 MOD 420

Osicom Technologies Inc., 198 Green Pond Rd., Rockaway, NJ 07866;
800-296-3456, 201-586-2550;
fax, 201-586-9740

List price (tested configuration): \$3,795.

Memory and processor RAM cache: 8MB 70-nS SIMMs, 64K external RAM cache.

Disk drives and controller: Fujitsu M2823T 12-ms 420MB IDE hard disk with 64K buffer (the IDE controller is on ISA card), 1.2MB and 1.44MB floppy disk drives.

Display: Osicom PQ-S311 adapter with S3 chip set and 1MB VRAM, 15-inch Samsung Sync Master 15-inch monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The Osicom i466 MOD 420 has a number of fine components. Processor and memory scores could be improved by increasing the cache size through an optional upgrade.

ON-READER SERVICE CARD

First SL notebook.



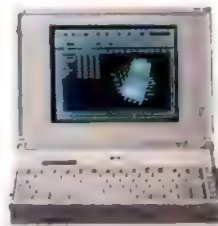
First Microsoft peer-to-peer notebook.



First upgradable-to-color notebook.



First notebook pre-loaded with
network client shells.



**We'd also be the first to
compare ourselves to our peers.
If we had any.**

You may be surprised to learn Zenith Data Systems is one of the world's biggest names in SL notebooks. Equally surprising is that we're #1 in the U.S. in SL based portables.^{††}

Maybe we're first in sales because we're first in technology. Zenith Data Systems created the first SL notebook. We're the first peer to peer notebook, first up-

gradable to color notebook and first with pre-loaded network client shells.



Now being #1 doesn't mean diddily if we don't deliver. But we're satisfying thousands by offering Z•NOTES of uncompromising quality, with ultra-low Z•DIRECT prices, with unstinting customer assistance and unrivaled Z•CARE service.

So since you're shopping, we invite comparisons. Only Z•NOTE



comes with built-in networking with Ethernet-compatible, high-speed communication pipes for

LAN connectivity. Only

While our competitors have been busy yelling, we've been busy selling. Guess who's #1 in SL portables?^{††}

The Z•NOTE



**\$2399
Z•DIRECT.
No ups,
no add-ons
no extras.**



Z•NOTE is pre-installed with client software for all three leading network systems—Novell, Microsoft and Banyan. Only Z•NOTE

JANUARY

1993



could be the first to pre-install Microsoft Windows for Workgroups. Only Z•NOTE exclusively uses Intel 386SL microproces-

sors. The Z•NOTE has an active matrix color display. The Z•NOTE comes with MS-DOS and Microsoft Windows fully loaded and ready to run, right out of the box.

And only Z•NOTE has the low Z•DIRECT price without additional or hidden charges. Those other guys will charge up to \$500 on extras to match Z•NOTE features, and you still won't

Sandy Blagojev,
Z•DIRECT
Account Executive.
"You can spend
up to \$500
over quote
and still
not get
networking
from those
other guys."

get networking.

So, which

will you buy?

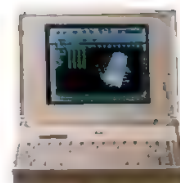
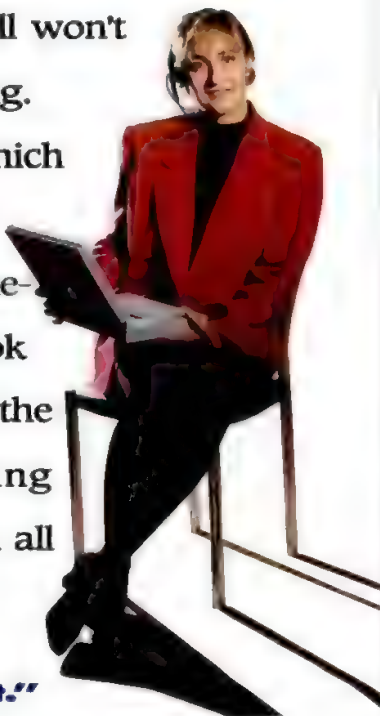
A johnny-come-lately notebook

from one of them. With none of the above. Or an award-winning Z•NOTE from Z•DIRECT. With all of the above.

"Prices change rapidly.
Call for our latest and lowest."



**48 hour delivery on all
featured products.
For product specifications
via FAX, please call
1-800-582-8194.**

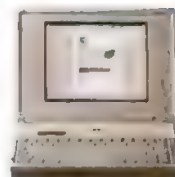


Z•NOTE™ 325L

"Built-in networking"

- Intel® 25 MHz i386™SL upgradable to i486™
- 4MB RAM user expandable to 12MB
- 85MB hard disk drive with MS-DOS® 5.0, Microsoft® Windows® 3.1 and Microsoft Windows for Workgroups™ pre-installed
- Logitech® TrackMan® Portable mouse
- 9.5" black-on-white LCD, upgradable to active matrix color, 640 x 480 VGA with support for 64 grey shades; and simultaneous video support
- 3.5" 1.44MB floppy disk drive
- 8.5" x 11.9" x 1.9" only 5.9 pounds
- Rapid-charge nickel metal-hydrate battery for up to 4 hours* continuous use or up to 10 hours* under Rest/Resume condition
- Pre-installed network client software for Novell® NetWare®, Microsoft LAN Manager,™ Banyan VINES™
- Ethernet-compatible high-speed communication port for LAN connectivity
- 82-key keyboard with 12 full-size function keys

\$2399



Z•NOTE 325Lc

"Incredible color and price"

- Intel 25 MHz i386SL upgradable to i486
- 4MB RAM, user expandable to 12MB
- 120MB hard disk drive
- MS-DOS 5.0, Microsoft Windows 3.1 and Microsoft Windows for Workgroups pre-installed
- Logitech TrackMan portable mouse
- 8.4" active matrix color VGA LCD, simultaneous video support
- 3.5" 1.44MB floppy disk drive
- 8.5" x 11.9" x 2.1" only 6.5 pounds
- Rapid-charge nickel metal-hydrate battery for up to 2.5 hours* continuous use or up to 6.5 hours* under Rest/Resume condition
- Pre-installed network client software for Novell NetWare, Microsoft LAN Manager, Banyan VINES
- Ethernet-compatible high-speed communication port for LAN connectivity
- Optional READYDESK™ Port Replicator (\$107)

Now Lower Price

\$3999

*Battery life depends on application used, power management features selected and peripherals attached

Network now with Z•DIRECT.

1-800-289-1276

**Call Z-DIRECT
for the first
flyweight
heavyweight.**

Chances are, what those new lightweight subnotebooks you're considering are light on are features and functionality. Especially if you use Microsoft Windows. So it's a



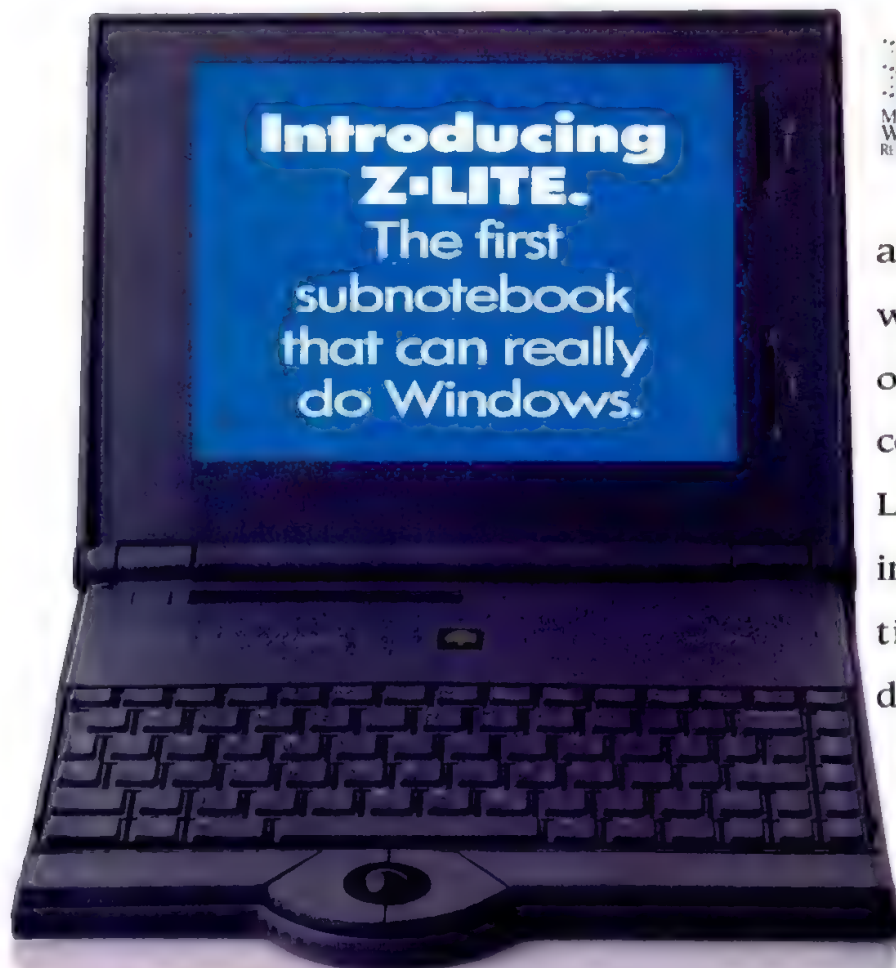
good thing you've discovered new Z-LITE 320L. Because no lightweight does Microsoft Windows like Z-LITE. Z-LITE combines every heavyweight feature you need to run Microsoft Windows in an ultra-lightweight PC. Like the power of Intel 386SL technology—instead of the no-name chip others foist off on you.

**The first
subnotebook
with two
PCMCIA
TYPE II SLOTS.**

The Z-LITE 320L includes our energy-

**The first
subnotebook
with backlit
VGA.**

efficient 3.3V design. It's our newest technology breakthrough, rewarding you with extraordinary battery life and extraordinary features. We even include an "at-a-glance" battery fuel gauge.



Then there's our full size 8.4" backlit VGA display. Rather than the pint-size unreadable screen you find elsewhere. You'll enjoy handling our upfront and center, integrated LITEPOINT pointing device. Others offer a tiny control that seems designed for Lilliputians.



**The first
3.3V
386SL
subnotebook.**

JANUARY
1993

So what more can we do for you?

Z•LITE 320L gives you flexibility and options. There's two PCMCIA card slots for accommodating high speed data/fax modems, wireless communications and more.

And to make your life easier, we've combined the external floppy disk drive and AC adapter/charger in an all-in-one design.

Z•LITE 320L is the best of Zenith Data Systems technology, with an unbeatable Z•DIRECT

"Z•LITE is light years ahead of the competition!"

Margie Silha,
Zenith Data
Systems

price. If lightweight is the way you want to go, Z•LITE 320L is the route to take.



Get Z LOW PRICE, call Z•DIRECT
1-800-289-1276

Now Z•LITE



Z•LITE™ 320L

"Full featured subnotebook"

- Intel 20 MHz i386SL (3.3V)
- 2MB RAM user expandable to 6MB
- 60MB hard disk drive
- MS-DOS 5.0 pre-installed
- Optional 3.5" 1.44MB external floppy disk drive
- Optional LITEPOINT™ two-button detachable pointing device
- 8.5" VGA backlit black-on-white display with 64 grey scales
- Two PCMCIA type II slots
- NiCad battery pack for up to 3-hours* continuous or up to 6-hours* charge
- 7.6" x 9.9" x 1.5" sloping to 1.1"
- 3.9 lbs

\$1899



ZDS 620nl

"Entry level i386SL notebook"

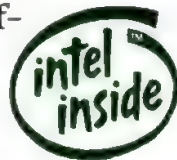
- Intel 20 MHz i386SL
- 2MB RAM user expandable to 8MB
- 60MB hard disk drive
- 3.5" 1.44MB floppy disk drive
- MS-DOS 5.0 pre-installed
- 9.5" black-on-white VGA display
- 85-key full-travel keyboard
- Serial port, enhanced parallel port, video port, mouse/keyboard/keypad port
- One internal modem socket
- NiCad battery pack for up to 3 hours* battery life
- 8.5" x 11" x 1.9" 6.5 lbs

Now Lower Price

\$1449

**Call Z•DIRECT for
the only PCs that
come with all these
big names:
Intel, Conner
and Jeffrey Crouch.**

At Zenith Data Systems we believe you deserve nothing less than blue chip components. So for our PCs, we offer names like Intel for microprocessors and Conner™ for hard drives.



CONNER

And for customer assistance, we offer names like Jeffrey Crouch. Now while Jeff may not be top of mind today, one call and you'll never forget him. Because all our Z•DIRECT customer assistance reps are more than high tech trouble shooters, they're investment counselors.

They understand Z•NOTES and Z•STATIONS are designed for **integrated connectivity**, with an unprecedented ease and breadth of upgradability. It's what we call **investment protection**. With so many options for upgrading your investment available on the market today, the good advice of our



Customer Assistance Center can be a big help. Our Customer Assistance Center is ready to answer your questions Mon.-Fri., 7 AM to 11 PM (CST). Call **1-800-CARE-360**.

All of which brings us to our renowned Z•CARE service. We think it's the best in the



Jeffrey Crouch,
Z•DIRECT Customer
Assistance Center
Representative.

**"I'm more than
just your helpful
hardware man."**



business. Because we offer over **400 authorized service centers** in North America and more than **2,000 service reps** around the world.

With that kind of blanket coverage, you can enjoy on-site service for all our desktops the next business day. There's 48-Hour Repair-and-Return or carry-in service for portables. And now Z-CARE offers **optional support upgrades** including network planning, start up, operation and expansion services. Even the com-

petition finds our service exceptional. Because we're authorized to keep your network operational even if there is a variety of other PC brands or software in place. As for our competitors, they can only send you to "3rd

party" service centers. But why go anywhere else when you can come to Z-DIRECT? Get Z series notebooks and PCs you want at a great low Z-DIRECT price—along with unrivaled Z-CARE service. That's what you can expect from the #1 name in SL portable computing.^{††}

95%

95% of calls to the Z-Direct Customer Assistance Centers enjoy one call problem resolution.

Z-DIRECT Customer Assistance Center.

Not just
troubleshooters,
investment
counselors.

**"Prices change rapidly.
Call for our latest and lowest."**

**Z BEST service is Z-DIRECT.
1-800-289-1276**



Z433DX

"Affordable 1486 performance"

- Intel 33 MHz i486DX
- 4MB RAM user expandable to 40MB
- 170MB hard disk drive with MS-DOS 5.0 and Microsoft Windows 3.1 pre-installed
- VGA color monitor, 256 colors
- 3.5" 1.44MB internal floppy disk drive
- Mouse
- 5 open 16-bit ISA slots
- One 5.25" accessible drive bay
- One-year limited warranty

\$1979



Z-STATION™ 466Dh

"High performance low price"

- Intel 66 MHz i486DX (upgradable)
- 8MB RAM user expandable to 64MB
- 200MB hard disk drive pre-installed and optimized with MS-DOS 5.0, Microsoft Windows 3.1 and Microsoft Windows for Workgroups
- Super VGA color monitor, 1024 x 768 upgradable to 256 colors
- Pre-installed network client software for Novell NetWare, Microsoft LAN Manager, Banyan VINES
- Ethernet-compatible high-speed communication port for LAN connectivity
- 3.5" 1.44MB internal floppy disk drive upgradable to 2.88MB
- State-of-the-art modular "snap-in" system design with 4 EISA slots
- Module sockets for SCSI and WAM (Windows Accelerator Module)
- Flash ROM BIOS
- Dual password security protection
- Serial, parallel, mouse, keyboard, video ports
- Microsoft mouse
- One-year limited warranty and on-site service included with extended Z-CARE™ service available

\$2999

You can't go wrong with our Buyer's Bill of Rights.

Buy Z•DIRECT for investment protection. Z series has unprecedented upgradability, integrated connectivity, ease of use and design. **Right** Buy Z•DIRECT for experienced direct sales consultants. No order takers at Zenith Data Systems. **Right** Buy Z•DIRECT for direct answers. 95% of your problems are solved in one call. **Right** Buy Z•DIRECT for direct, 48-hour shipment. **Right**

If it's not Z•DIRECT it's just not right.

Buy Z•DIRECT for no hassle returns. No questions asked, whatever the reason. Return your PC within 30 days.** **Right** Buy Z•DIRECT for direct technical support and a

complete array of direct-to-you peripherals, accessories and software. **Right**

*Based on advertised products as configured and availability.



Terms: MasterCard, Visa, Discover and American Express accepted. **No surcharge for credit card orders.** Money orders, certified checks, personal checks accepted (allow ten days for processing). Company and institutional P.O.'s upon credit approval. Prices do not include applicable sales tax, shipping and handling. Government, Education and Volume Purchase buyers please call for a quotation. Federal Government Sales please call 1-800/843-4131. **30-day money-back guarantee applies only when buying through Z•DIRECT. Excludes opened software and purchase which have been subject to abuse. Most notebooks include one-year limited mail-back warranty with optional Z•CARE service available (call, or see a Z•CARE contract for important details). †Based on ZDS price and manufacturer's suggested retail price for third party products. ††Source: International Data Corporation for 1991, published 10/92.

Order by FAX 1-800-472-7211. All products subject to availability. Specification and prices subject to change without notice. Zenith Data Systems is not responsible for typographical or photographic errors. Z•NOTE, Z•LITE, Z•SPORT, Z•STATION, Z•VISION, READYDESK and LITEPOINT are trademarks and Z•CARE is a servicemark of Zenith Data Systems Corporation. MS-DOS and Microsoft are registered trademarks and Windows, LAN Manager, Windows for Workgroups, Works for Windows and the Windows Ready-To-Run logo are trademarks of Microsoft Corporation. Intel is a registered trademark and i386, i486 and the Intel Inside logo are trademarks of Intel Corporation. Novell and NetWare are registered trademarks of Novell, Inc. Banyan and VINES are registered trademarks of Banyan Systems, Inc. Logitech and TrackMan are registered trademarks of Logitech, Inc. Conner is a trademark of Conner Peripherals, Inc. Okidata and MICROLINE are registered trademarks of Oki Electric Industry Co., Ltd. Texas Instruments is a trademark of Texas Instruments, Inc. Copyright © 1992 Zenith Data Systems Corporation.

Now call Z•DIRECT
1-800-289-1276

New Year's Specials



Small business productivity package "Z•425SX"

- Intel 25 MHz i486SX
- 4MB RAM user expandable to 40MB
- 80MB hard disk drive with MS-DOS 5.0 and Microsoft Windows 3.1 pre-installed
- Z•VISION™ 14" VGA color monitor
- Mouse and mouse pad
- Okidata® MICROLINE® 380 80 column dot matrix printer (24 pin)
- Dacasey Instant Accounting for MS-DOS and Microsoft Windows consisting of accounts receivable, accounts payable and general ledger
- Microsoft Works for Windows™ consisting of spreadsheet, word processor and chart maker
- 10-3.5" DSHD formatted diskettes
- Premium parallel printer cable

New Lower Price

\$1895

Over \$2,200 value based on manufacturer's suggested retail price†



Desktop publishing combo "Z•STATION 433DX"

- Intel 33 MHz i486DX
- 4MB RAM user expandable to 64MB
- 200MB hard disk drive with MS-DOS 5.0, Microsoft Windows and Microsoft Windows for Workgroups pre-installed
- Ethernet-compatible high-speed communication port
- Z•VISION 14" SuperVGA color monitor
- Microsoft Mouse and mouse pad
- Texas Instruments™ MicroLaser Plus P517 postscript printer
- Publisher's Showcase for Windows consisting of Aldus Pagemaker, Aldus Freehand and Aldus Photo Styler
- Premium parallel printer cable

New Lower Price

\$4195

Over \$5,000 value based on manufacturer's suggested retail price†



ZENITH DATA SYSTEMS

A Bull Company

Thinking Ahead.

board will accept up to 256K of RAM cache, PC Brand sells only 64K. Our test model, a desktop configuration, had four bays, five slots (though all were available), and a hard disk with only 170MB.

Cutting corners on the configuration was reflected in performance. The Leader Cache, which comes with a Logitech mouse, had an excellent memory score and placed above the mean with its processor test results. Its DOS video score was slightly below average, and its Graphics Winmark score—reflecting the lack of a graphics accelerator—was near the bottom. It also placed poorly with its DOS and Windows disk test scores, perhaps because the Conner drive had only a 64K buffer.

PC Brand offers a one-year warranty that includes on-site service from IDEA ServCom.—HFW

PC Pros/Touche Inc.

PC Pros 486/66DX2 5550T

Priced at \$3,116, the PC Pros 486/66DX2 5550T tower has great expansion characteristics. It gave its best performance on our processor and memory test routines.

This standard ISA-based tower holds nine drive bays. Six 5.25-inch bays open



The PC Pros 486/66DX2 5550T

to the front; three 3.5-inch drive bays are internal. Once you get inside, the internal bays are easy to reach, and the 300-watt power supply is large enough to handle just about anything you might put in this machine. Outside is a plastic door that protects the drives from dust; a window lets you see the digital speed display, power switch, turbo, and reset buttons.

The unit's well-respected AMI Super Voyager motherboard comes with 256K of 15-nanosecond RAM cache. As with

SUITABILITY TO TASK				
PC Pros 486/66DX2 5550T				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	○

the IDS 466i2, which has the same motherboard and cache configuration, this arrangement led to sparkling memory and processor performance: The unit ranked within the top 15 percent, placing tenth and eleventh, respectively, on our memory and processor test routines. But it stumbled fairly badly on disk performance under both DOS and Windows, placing in the bottom third. A caching disk controller might help raise scores for this system.

Video scores revealed a strong bias in the direction of Windows. The National Design 24-bit color VGA card carries an S3 chip, so it wasn't surprising to see the PC Pros take ninth place in Windows graphics performance. The low DOS video score is characteristic of S3 performance. A strong point in the unit's favor is its excellent 15-inch

FACT FILE

PC Pros 486/66DX2 5550T
*PC Pros/Touche Inc., 8205 S. Cass Ave.,
 Darien, IL 60559; 708-810-1010;
 fax, 708-810-9490*

List price (tested configuration): \$3,116
Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.
Disk drives and controller: Micropolis 1684 14-ms 340MB SCSI-2 hard disk with 64K buffer, UltraStor ULTRA 14F ISA SCSI controller, 1.2MB and 1.44MB floppy disk drives
Display: National Design Inc. Volante WARP 10 adapter with S3 chip set and 1MB VRAM, 15-inch NEC 4FG monitor with 72-Hz refresh rate at 1,280-by-1,024
Software: DOS 5.0, Microsoft Windows 3.1.
In short: The PC Pros 486/66DX2 5550T delivered excellent processor and memory scores. Disk performance was slow, and video performance was strongly Windows-oriented

ON READER SERVICE CARD

NEC 4FG monitor.

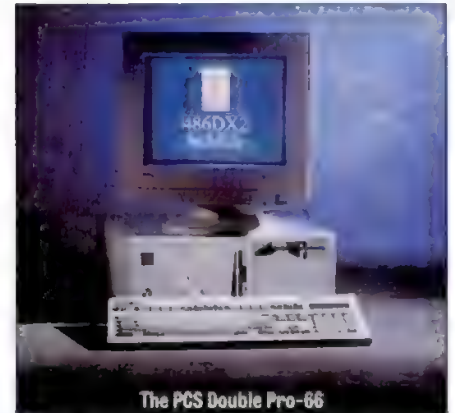
DOS and Windows cost extra, but PC Pros/Touche offers a two-year warranty on parts and labor. You can also purchase on-site service for the first year from TRW for only \$29.—HFW

Performance Computer Systems Inc.

PCS Double Pro-66

Clearly designed as a moderately priced entry to high-end computing, Performance Computer Systems' PCS Double Pro-66 delivers on the 66MHz-CPU performance promise, but its weak video subsystem seriously hampered its Windows graphics test score.

With its solid performance on our



DOS and Windows disk test routines, and especially with its outstanding processor and memory scores, the PCS could be a considered for use as an inexpensive file server. However, its ISA bus and limited expansion possibilities may weigh against really heavy server duty.

Housed in a standard desktop AT-style case, the PCS system scored admirably on our DOS-based test routines. Served well by a 256K external direct write-back cache, it ranked among the top ten machines in DOS processor performance and placed eleventh in DOS memory performance. The Quantum 245MB IDE drive placed in the top half of the test group in both DOS disk performance and Windows disk performance.

Using a Diamond SpeedSTAR VGA adapter based on the Tseng ET4000 controller, the system's DOS video results were quick enough, but the system turned in one of the lowest Windows

COMPUTERS

486DX2/66s

SUITABILITY TO TASK				
PCS Double Pro-66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

graphics scores in this review.

If graphics are what you're after, there is more you will have to upgrade, since the accompanying NEC MultiSync 3FGx

Designed as a moderately priced high-end computer, the PCS system delivers on the 66-MHz performance promise.

monitor will only take you up to 1,024-by-768 noninterlaced resolution. The AMI 486 Super Voyager motherboard's integrated I/O and floppy and hard disk controllers leave six 16-bit ISA

slots open.

Like some other, more progressive companies, PCS offers a two-year warranty on parts and labor.—John Quain

Polywell Computers Inc.

Poly 486-66LM

Polywell Computers' \$3,300 Poly 486-66LM faces the same problem as do many other PCs in this roundup: Its proprietary local bus design offers promise but fails to deliver. And while this PC wouldn't be appropriate as a file server, it should



The Poly 486-66LM

work well as a Windows workstation.

Wrapped in an attractive medium-size tower case, the Poly 486-66LM has five external bays (three 5.25-inch and two 3.5-inch) and one internal 3.5-inch bay. The external drive bays are covered by a swing door panel. The Polywell system uses an Orchid Technology motherboard that features a 32-bit local-bus slot for improving video performance. However, the proprietary slot doesn't produce the Windows boost it promises, primarily because the local-bus Orchid Fahrenheit 1280° board uses an S3 911 controller,

SUITABILITY TO TASK				
Poly 486-66LM				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	○
Expandability	●	●	○	○

which imposes its own 16-bit bottleneck on the 32-bit local bus. On the DOS video test routines, it demonstrated poor speed, but the local-bus position did assist its above-average performance in Windows.

As with other proprietary local-bus

FACT FILE

Poly 486-66LM

Polywell Computers Inc., 61-C Airport Blvd.
South, San Francisco, CA 94080;
800-999-1278, 415-583-7222;
fax, 415-583-1974

List price (tested configuration): \$3,300.

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.

Disk drives and controller: Fujitsu 12-ms 320MB IDE hard disk, Promise controller with 512K cache, 1.2MB and 1.44MB TEAC floppy disk drives.

Display: Orchid Fahrenheit 1280° local-bus video adapter with 1MB RAM, 15-inch ADI display with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The unit may not be the best in any one category, but its above-average scores on our processor and disk test routines under DOS gave it a high overall DOS score. With its solid Graphics Winmark test results, it could be considered a candidate for a graphics workstation.



FACT FILE

PCS Double Pro-66

Performance Computer Systems Inc., 35520 Mound Rd., Sterling Heights, MI 48310; 800-473-7367, 313-795-9209; fax, 313-268-3313

List price (tested configuration): \$3,895.

Memory and processor RAM cache: 8MB 70-ns RAM, 256K cache

Disk drives and controller: Quantum 16-ms 245MB IDE hard disk with 256K cache, integrated controller, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond SpeedSTAR adapter with Tseng ET4000 chip set with 1MB DRAM, NEC MultiSync 3FGx 15-inch monitor with 60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: The PCS Double Pro-66 logged very impressive DOS processor and memory test scores, and the disk scores were solid as well. Only the Windows graphics performance was weak because of a DOS-oriented chip set.



designs, Polywell's approach may already be obsolete. The up-and-coming VESA local-bus standard has garnered wide support from many component vendors, including Orchid.

In other respects, the Polywell system did well. It stayed with the top pack on processor speed, assisted by a 256K external cache that has a four-way set-associative architecture and a direct write-back write policy. Its class standing dropped on the memory test routines, however. The 320MB Fujitsu IDE hard disk in our test unit was a second-tier DOS performer but managed respectable disk performance under Windows.

Polywell offers a very generous five-year warranty on labor and two years on parts. On-site service is \$75 for the first year.—JQ

QSI Corp.

Klonimus 486DX2/66

QSI Corp. is a participant new to the national computer scene. Its \$3,650 Klonimus 486DX2/66 entry is marked by a moderate price and an aggressive warranty policy.

COMPUTERS

486DX2/66s



The QSI Klonimus 486DX2/66

The outside of this standard small-footprint desktop case is entirely unremarkable, except for what sits on top. QSI has adorned its otherwise-average product with one of the better monitors around: the MAG MX15F, a 14-inch analog monitor that offers excellent image quality and programmable controls. A software program installed on the hard disk allows you to configure the monitor for different graphics modes and resolutions.

Once open, however, the Klonimus looks very much like yesterday's machine. A standard ISA motherboard of-

fers little ease of upgrade and no integrated components such as I/O ports, video, or drive controller circuitry. This results in only four vacant 16-bit slots and one vacant 8-bit slot. Access to the processor, which is set in a standard socket, is blocked by the hard disk. Cables, power connectors, the hard disk, and the power supply prevent easy access to the memory banks as well.

Performance was unremarkable for the most part, except for the processor score, which ranked the unit 16th among our test group. Our test unit's implementation of a 340MB Maxtor SCSI-2 hard disk resulted in noticeably low numbers on our disk test routines under both DOS and Windows.

SUITABILITY TO TASK				
Klonimus 486DX2/66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

QSI offers a two-year warranty on parts-and-labor. The company handles its own on-site service, which is free during the first year. As a newcomer, however, QSI will need to distinguish itself a little better if it hopes to draw customers away from the more established competition.—OR

Quill Corp.

Qtech 486 4D2/66

What most users will notice about Quill Corp.'s Qtech 486 4D2/66 is the lack of special performance-enhancing features. A serviceable system with an above-average



The Qtech 486 4D2/66

FACT FILE

Qtech 486 4D2/66

Quill Corp., 100 Schelter Rd., Lincolnshire, IL 60069; 708-634-6650; fax, 708-634-5699

List Price (tested configuration): \$3,650

Memory and processor RAM cache: 4MB 70-ns SIMMs, 256K cache.

Disk drives and controller: Maxtor 15-ms 334MB SCSI hard disk, Adaptec SCSI controller, 1.2MB and 1 44MB Teac floppy disk drives.

Display: STB Wind/X adapter with S3 chip set and 1MB RAM, 14-inch Tatung monitor with 60.5-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, choice of Quattro Pro for DOS 4.0 or Quattro Pro for Windows 1.0

In short: Quill's Qtech is a straight-forward, no-frills desktop PC that fared less than spectacularly on our benchmark tests. The unit comes with a 334MB Maxtor SCSI hard disk, but it posted a below-average disk test score under DOS. And despite a 256K external RAM cache, the Qtech demonstrated slow processor and memory performance as well.

ON READER SERVICE CARD

age \$3,650 price tag, this ISA-based PC came up short on our benchmark tests. It comes in an old-fashioned AT-style case with the power switch near the back. The motherboard, however, is easily accessible; all five 16-bit slots (three are vacant) can handle full-length cards.

Despite the presence of a 256K external RAM cache, the Qtech was sluggish on our processor and memory benchmark tests. It posted rather slow disk scores under DOS as well.

The Maxtor 334MB SCSI hard disk affords adequate storage, and the Adaptec

SUITABILITY TO TASK				
Qtech 486 4D2/66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

controller gives you the ability to add up to six more SCSI devices. But the Maxtor's tiny 32K buffer didn't do much to boost disk performance under DOS. Under Windows, however, the unit was in close range with the other contenders.

FACT FILE

Klonimus 486DX2/66

QSI Corp., 95 Rockwell Place, Brooklyn, NY 11217; 800-347-5500, 718-834-4545; fax, 718-834-5318

List price (tested configuration): \$3,650

Memory and processor RAM cache: 8MB 60-ns RAM, 256K cache.

Disk drives and controller: Maxtor LXT340SY SCSI-2 340MB hard disk, Adaptec AHA-1542B controller, 1.2MB and 1.44MB floppy disk drives

Video: ATI Graphics Ultra adapter with ATI 38800 chip set and 1MB VRAM, 15-inch MAG MX15F monitor with 60-Hz refresh rate at 1,024-by-768

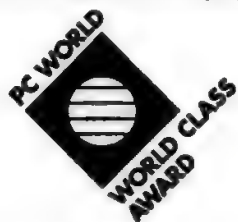
Software: DOS 5.0, Microsoft Windows 3.1

In short: With a good service and support policy, the Klonimus valiantly attempts to stand out. But its nonintegrated motherboard design, its standard-socketed processor, and an interior layout that makes its processor and memory banks difficult to reach means it will have to try a little harder

ON READER SERVICE CARD

Looking for a minor

1990, 1991 and 1992 World Class Awards
for Best Mail-Order Company



□ 3½" format available from us. Specify when ordering.
 ☐ package includes both 5¼" and 3½" disks.
 ☐ 3½" format available from manufacturer by request. Call us for details.
 All software is not copy-protected, unless indicated otherwise by (CP).

The four-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

We carry only the latest versions of products. Version numbers are current at press time. Products listed here in red are Microsoft Windows Applications.

COMPETITIVE UPGRADES

Please call for criteria to qualify to trade up for these popular products. Policies may vary depending on vendor.

Adobe Systems	
5988	☐Illustrator 4.0 Competitive Upgrade. \$189.
Alpha Software	
9724	☐Alpha FOUR 2.0 Competitive Upgrade. 99.
Approach Software	
3830	☐Approach for Windows Comp. Upgrd. 139.
Borland International	
7030	☐Quattro Pro 4.0 Competitive Upgrd. 95.
3684	☐Quattro Pro 1.0 for Windows Competitive Upgrade. 89.
3658	☐Quattro Pro for WinDOS Competitive Upgrade. 139.
7988	☐Paradox 4.0 Competitive Upgrade. 179.
Claris Corp.	
5228	☐FileMaker Pro Competitive Upgrade. 95.
Corel Systems	
4560	☐CorelDRAW! 3.0 Competitive Upgrade. 225.
4562	☐CorelDRAW! Comp. Upgrd. CD-ROM 199.
Expervision	
8403	☐TypeReader 1.01 Competitive Upgrd. 149.
Gold Disk	
5412	☐Gold Disk Profess. Draw Comp. Upgrd. 115.
Lotus	
1847	☐Ami Pro Competitive Upgrade. 99.
4983	☐Freelance for Windows 1.0 Version or Competitive Upgrade. 99.
1855	☐Freelance 4.0 Version or Comp. Upgrd. 99.
3424	☐1-2-3 1.1 for Windows Version or Competitive Upgrade. 99.
Microcom	
6956	☐CarbonCopy for Windows Comp. Upgrd. 69.
Microsoft	
8560	☐Works for Windows 2.0 Competitive Upgrade. 75.
8354	☐Visual Basic 1.0 Competitive Upgrd. 95.
5693	☐Excel 4.0 Competitive Upgrade. 125.
8353	☐PowerPoint 3.0 Competitive Upgrade. 125.
3881	☐Word for Windows 2.0A Comp. Upgrd. 125.
7274	☐C/C++ Competitive Upgrade. 135.
8384	☐Fox Pro 2.0 Competitive Upgrade. 189.
Symantec	
6341	☐Q & A 4.0 Competitive Upgrade. 95.
6334	☐TimeLine for Windows Comp. Upgrd. 189.
Spinnaker	
7408	PFS: WindowWorks 2.0 Competitive Upgrade (3½" only) 49.



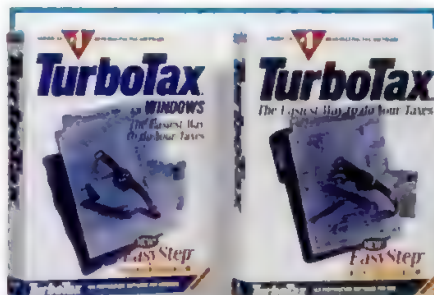
Practical Peripherals/Delrina Technology
 Practical Peripherals Modems provide high-speed Hayes compatible data & Group II S/R fax capabilities. Made in the USA with a lifetime warranty. Delrina's WinFax Pro 3.0 sends, receives & manages faxes from within Windows. Send faxes as easily as you print documents. OCR Technology converts incoming faxes into editable files. These bundles offer superb values in total fax solutions.

9054 PM14400FXSA w/WinFaxPro....	\$399.
9051 PM14400FX with WinFaxPro.....	379.
9052 2400EFXSA with WinFaxPro.....	199.
9053 2400EFX with WinFaxPro.....	189.
9050 PM2400FSA with WinFaxPro.....	139.
9042 PM2400F with WinFaxPro.....	119.

SOFTWARE

AddStor	
4090	☐SuperStor 2.0 59.
8807	☐SuperStor Pro 1.0 85.
Adobe Systems	
7547	☐Adobe Type Manager 2.0 for Windows 59.
6591	☐Adobe Illustrator 4.0 for Windows..... 389.
5988	☐Adobe Illustrator Competitive Upgrade 189.
7940	☐Adobe Type Set Value Pack (30 fonts) 39. (Entire Adobe Type Library available.)
Aldus	
1332	☐PageMaker 4.0 for Windows 499.
7744	☐Publishing Showcase (PageMaker, FreeHand, Photostyle)..... 669.
6223	☐Gallery Effects 1.0 for Windows 139.
7540	☐IntelliDraw 1.0 for Windows 199.
Alpha Software	
9724	☐Alpha FOUR 2.0 Competitive Upgrade 99.
5104	☐Alpha FOUR 2.0 (incl. Free 2 LAN Pack) 329.
Altsys Corporation	
8675	Fontographer for Windows (3½" only) .. 259.
Application Techniques	
8337	☐WinDings 1.0 for Windows 49.
1214	☐Pizazz Plus 3.0 79.
Approach Software	
6598	☐Approach 2.0 for Windows 259.
3830	☐Approach 2.0 Competitive Upgrade..... 139.
Ares Software	
6030	☐FontMonger 1.06 for Windows 89.
Artisoft	
2455	Lantastic AE-2 EtherNet Starter Kit 4.1 (incl. software, 2 EtherNet cards, cable).... 469.
9775	Lantastic AE-2 Starter Kit for Windows 499.
2452	AE-2 EtherNet Adapter Card..... 199.
Atech Software	
4797	☐AllType 2.0 (universal typeface converter) .. 45.
Automap	
2729	☐Automap USA for DOS..... 55.
8569	☐Automap USA for Windows 55.
6700	☐Automap Europe..... 79.
Avery Dennison	
6006	☐Label Pro 1.8 (Laser)..... 49.
Banner Blue Software	
3322	☐Family Tree Maker 2.0..... 39.
2088	☐Org Plus 1.0 for Windows..... 125.
Berkeley Systems	
5885	☐After Dark 2.0 for Windows..... 29.
6649	Star Trek: The Screen Saver (3½" only) 34.
Bitstream	
8040	Bitstream Li'l Bits (3½" only)..... 19.
6066	☐FaceLift 1.5 for WordPerfect 5.0/5.1.... 69.
2089	☐TrueType Font Pack 1 for Windows 3.1 52.
9635	☐MakeUp 1.0 for Windows 3.0/3.1 99.
Borland International	
9635	☐Object Vision 2.1 99.
3379	☐Quattro Pro WinDOS (Windows & DOS) 299.
1514	☐Paradox 4.0 529.

Broderbund	
1434	☐New Print Shop 3.0..... 35.
5900	☐PC USA 2.0 29. 5902 ☐PC Globe 5.0 39.
8855	☐Print Shop Deluxe 1.0..... 45.
ButtonWare	
6419	☐PC-File 6.5..... 85.
Caere	
4130	☐Faxmaster 1.0..... 159.
6568	☐OmniPage Direct 1.0..... 259.
8933	☐OmniPage Professional 2.1 629.
Calera	
1769	☐Fax Grabber 1.2 55.
1953	☐WordScan Plus 1.1 429.
Central Point	
5039	☐PC Tools 8.0..... 125.
9751	☐AntiVirus 1.4 89.
8114	☐Backup 7.1 (DOS and Windows)..... 89.
ChipSoft	
1663	☐Turbo Tax Personal 1040 for DOS 49.
3517	☐Turbo Tax Personal 1040 for Windows... 49.
6221	☐Turbo Tax/Quicken Bundle 10.0/6.0 Headstart version..... 59.
3080	☐Turbo Tax Windows/Quicken Bundle 10.0/6.0 59.
	☐Turbo Tax State Packages for DOS...ea. 39.
Claris Corp.	
5257	☐FileMaker Pro for Windows 268.
5228	☐FileMaker Pro Competitive Upgrade ... 95.
CompuServe	
7546	☐DOS Membership Kit 2.0..... 25.
Computer Associates	
5779	ACCPAC Simply Accounting 1.0 for Windows (3½" only)..... 119.



ChipSoft

☐Turbo Tax Personal 1040—Over 90 forms, schedules & worksheets, IRS instructions, & EasyStep, a revolutionary new tax preparation system. \$5 rebate available from ChipSoft. 3517 for Windows.. \$49. 1663 for DOS.. \$49.

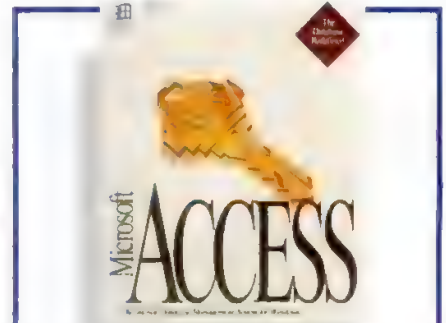
Christmas miracle?



Inset Systems

20 ☐ **HiJaak 1.0 for Windows**—Enhances & prints graphics images. Converts 23 raster, 15 vector, & 24 fax card formats. Captures graphics screens from Windows & graphics & text screens from DOS applications \$139.

7983	☐ Smartcom EXEC 2.1	\$69.
	Hewlett-Packard	
8731	☐ Dashboard 1.0 for Windows (while supplies last)	32.
	IBM	
2666	☐ DOS 5.0 Upgrade	59.
7303	☐ OS/2 2.0 Upgrade from DOS	99.
	Inset Systems	
7298	☐ HiJaak 2.1 139. 3820 ☐ for Windows 139.	
	Intuit	
2426	☐ Quicken 5.0 45. 5596 ☐ for Windows 45.	
6158	☐ QuickBooks 1.0	89.
	LaserTools	
6882	☐ PrintCache 3.0	99.
9510	☐ PrimeType 1.0 for WordPerfect	62.
	Light Source	
7415	☐ Ofoto 1.0 for Windows	195.
	Lotus	
5417	☐ 1-2-3 3.1 Plus	399.
5653	☐ 1-2-3 2.4	335.
1852	☐ 1-2-3 2.4 Upgrade	99.
2755	☐ 1-2-3 1.1 for Windows	335.
3424	☐ 1-2-3 1.1 for Windows Upgrade	99.
5799	☐ Ami Pro 3.0 249. 1847 Comp. Upgrd. ..	99.



Microsoft

8355 ☐ **Access 1.0 for Windows**—Visual database management system. Provides powerful features, allows you to work with data in virtually any database format. & is easy to learn & use. Intro. price ends 1/31 93.. \$95.

	Concentric Data Systems	
6575	☐ R & R Report Writer 5.0	159.
	Contact Software	
1625	☐ Act! 2.1	229.
	Corel Systems	
5506	☐ CorelDRAW! 3.0	395.
4560	☐ CorelDRAW! 3.0 Competitive Upgrd.	225.
	Data Storm	
4798	☐ PROCOMM PLUS 2.01	69.
6918	☐ PROCOMM PLUS 1.0 for Windows	99.
	DCA/Crosstalk	
5611	☐ Crosstalk 2.0 for Windows	119.
	Delrina Technology	
2446	☐ WinFaxPro 3.0	79.
5974	☐ DOSFax PRO 2.0	49.
7351	☐ PerForm PRO Plus 1.0	239.
	Expervision	
7494	☐ TypeReader 1.01 Windows (\$100 rebate) ..	499.
	Fifth Generation Systems	
7725	☐ Direct Access 5.1	64.
3950	☐ Fastback Plus 119. 6431 ☐ Windows 119.	
	Fractal Design	
4356	☐ Painter 1.0 for Windows	259.
7822	☐ Sketcher 1.0 for Windows	95.
	Gibson Research	
9832	☐ SpinRite II 2.0	59.



TIMESLIPS

5698 ☐ **Timeslips Release 5**—See where your hours are going with Timeslips Release 5. Reengineered for today's business & service professionals. New features including multiple billing rates & many new reports \$189.

3523	☐ Freelance 1.0 for Windows	349.
5981	☐ SmartSuite (Ami Pro, Freelance, and 1-2-3 for Windows)	469.
2748	☐ cc:Mail Windows Platform Pack	325.
	MECA	
2798	☐ Managing Your Money 9.0	45.
4603	☐ Tax Cut 1992 (Headstart Edition)	45.
3885	☐ Tax Cut 1992 Windows (Headstart)	45.
	Microcom	
6234	☐ CarbonCopy Plus 6.1 129. 6958 Upgrd. 45.	
4410	☐ CarbonCopy Plus 1.0 for Windows	129.
	Micrografix	
3627	☐ Windows Draw! 3.0	99.
	MicroLogic Software	
8579	☐ MoreFonts 3.0	75.
5350	☐ TrueType 1.0 for DOS	49.

	Microsoft	
8355	☐ Access 1.0 for Windows (intro price)	95.
3338	☐ Money 2.0 for Windows	19.
7010	☐ Windows 3.1	89.
6207	☐ Windows for Workgroups 1.0	149.
6224	☐ Windows for Workgroups Upgrade	89.
6141	☐ Windows for Workgroups Add-on	59.
2904	☐ Works 2.0. 95. 2735 ☐ Windows ..	129.
3337	☐ Publisher 1.0 for Windows	129.
7387	☐ PowerPoint 3.0 for Windows	299.
6195	☐ Word 2.0 for Windows	299.
2856	☐ Excel 4.0 for Windows	299.
7388	☐ Project 3.0 for Windows	445.
8137	☐ Office 3.0 for Windows	479.
1620	☐ MS-DOS 5 Upgrade	59.
6188	☐ FoxPro 2.0	479.
1624	☐ Visual Basic 2.0 Windows Std. Edition ..	89.
	MicroSpeed	
8659	☐ Cursor Deluxe 1.0	27.
	Nolo Press	
2982	☐ WillMaker 4.0	35.
	Norton-Lambert	
2753	☐ Close-Up Dual Pack for Windows & DOS ..	129.
	Panacea	
2413	☐ WinSpeed 1.0 (Windows accelerator) ..	55.
	PC-Kwik	
8565	☐ WinMaster 1.0	65.
4925	☐ PC-Kwik Power Pak 3.0 w/Power Disk ..	79.
	Peashtree	
5757	☐ Accounting 5.0 for Windows	79.
	Personics	
9288	☐ Laptop Ultravision 2.1 (3 1/2" only)	59.
	Polaris Software	
4395	☐ PackRat 4.1	249.
	Qualitas	
7539	☐ 386MAX 6.02	59.
	Quarterdeck	
3221	☐ Expanded Memory Mgr. 386 6.0	59.
4586	☐ DESQview 386 2.4	129.
6589	☐ DESQview/X 1.0	169.
	QUE Software	
3091	☐ RightWriter 6.0 for Windows	49.
	Reality Technologies	
8564	☐ Smart Investor 1.0	59.
	Reference Software	
4396	☐ Grammatik V 55. 7483 ☐ for Windows ..	55.
	Shapeware	
5428	☐ Visio 1.0 for Windows	199.
	Sitka	
5450	☐ 10NET Two-User Network Pack	129.
6440	☐ 10NET Expander Pack (3 nodes)	189.



SYSTAT, Inc.

1221 **SYSTAT 5.0 for Windows**—Award-winning statistics & graphics program. QuickStat buttons; easy access to data (3 1/2" only) \$699.
1220 ☐ **FASTAT 2.0 for DOS**—Subset of SYSTAT. Ideal for those who are not statisticians.. 399.

800-800-0004



PC Connection

6 Mill Street
Marlow, NH 03456

SALES 603-446-0004 FAX 603-446-7791

PC CONNECTION

Call by 3 a.m. 12/24



Quarterdeck

4586 □ **DESQview 386 2.4**—Create a true windowing, task switching, & multitasking (DOS & Windows) environment on your 386 or 486 computer. Includes DESQview, QEMM-386 6.0, & Manifest..... **\$129.**

Sofnet

- 5883 FaxWorks 2.5 (3 1/4" only) Windows & DOS 65.
- Software Publishing**
- 3482 □ Harvard Graphics 3.0 399.
- 4403 □ Harvard Graphics 1.0 for Windows.... 369.
- Stac Electronics**
- 1409 □ Stack 2.0 95.
- Stairway Software**
- 6430 □ Screen Extender 2.0 for WordPerfect 5.0/5.1 59.
- Symantec**
- 3784 □ The Norton Backup 2.0 for Windows... 99.
- 3146 □ The Norton Utilities 6.0 115.
- 7999 □ Norton Anti-Virus 2.1 84.
- 2359 □ The Norton Desktop 2.0 for Windows 115.
- 8378 □ Norton PC Anywhere 4.5 119.
- SYSTAT, Inc.**
- 1220 □ FASTAT 2.0 for DOS 399.
- 1221 SYSTAT 5.0 for Windows (3 1/4" only).... 699.
- 3-D Visions**
- 6210 □ Stanford Graphics 2.0 for Windows... 359.
- TIMESLIPS**
- 5698 □ Timeslips Release 5 189.
- T/Maker**
- 6027 □ Fax Mania DOS or 7911 Windows ea. 27.
- Touchstone Software**
- 7420 □ Check It Plus 3.0 85.
- Traveling Software**
- 4407 □ LapLink Pro 4.0 99.
- WordPerfect Corporation**
- 3804 □ WordPerfect 269. 3494 □ for Windows .279.
- XTree**
- 8328 □ XTree 1.0 for Windows 65.
- 6161 □ XTree Gold 2.5 95.



Application Techniques

8337 □ **WinDings 1.0 for Windows**—Handy, inexpensive, and easy to use. WinDings for Windows solves many of your day-to-day information problems **\$49.**

RECREATIONAL/EDUCATIONAL

- Abracadabra**
- 3629 □ Design Your Own Home-Architecture .. \$32.
- ActiVision**
- 5401 □ Shanghai II 29.
- 5400 □ Sargon V (computer chess)..... 29.
- Buena Vista Software**
- 8351 □ Heaven and Earth 1.0 29.
- Broderbund ... CP**
- 3340 □ Kid Pix 1.0 35.
- 5851 □ SimCity 1.0 from Maxis 29.
- 4411 □ SimEarth 1.0 for Windows from Maxis 45.
- Davidson & Associates**
- 3947 □ Math Blaster Plus 29.
- 7727 □ Kid Works 2 35.
- Edmark**
- 7477 □ Kid Desk 1.0 26.
- Great Wave Software**
- 8390 □ NumberMaze 1.0 - DOS 25.
- HyperGlot Software**
(French, German, Italian, Spanish available.)
- Word Torture for Windows ea. 34.
- Word Torture 3.0 ea. 29.
- Interplay**
- 8653 □ Mario Teaches Typing 24.
- 4692 □ Dvorak on Typing for Windows 29.



Creative Labs ... 1 year

5770 **Sound Blaster 16**—16-bit CD-quality stereo sound. Includes stereo digital/analog mixer, built-in power amplifier, MIDI and CD-ROM interfaces **\$229.**

Knowledge Adventure

- 6456 □ Isaac Asimov's Science Adventure 49.
- 3510 □ Space Adventure 49.
- Konami/Ultra Software**
- 4909 □ Batman 39.
- 5095 □ Teen. Mutant Ninja - Manhattan Mission 29.
- Microsoft**
- 5514 □ Entertainment Pack 4 29.
- 2858 □ Flight Simulator 4.0 39.
- 8492 □ Golf for Windows 45.
- Penton Overseas**
- VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) ea. 35.
- Personal Training Systems**
- Training tutorials-beg. to adv. for Windows, Excel, PageMaker, WordPerfect, Ami Pro, Microsoft Word & Lotus 1-2-3 (3 1/2") ea. 49.
- Sierra On-Line ... CP**
- 8591 □ Quest for Glory III 39.
- 5150 □ Aces of the Pacific 45.
- 5338 □ King's Quest 6 45.
- Software Marketing Corporation**
- 5147 □ Orbits 1.0 39.
- 5145 □ Bodyworks 1.0 or 8531 □ Autoworks ea. 49.
- Software Toolworks**
- 4534 □ Mavis Beacon Teaches Typing 2.0 (CP) 29.
- 3023 □ ChessMaster 3000 29.
- 3032 □ ChessMaster 3000 for Windows 35.
- 5032 □ Miracle Piano Teacher (incl. kybd.) 325.



Hewlett-Packard ... 1 year

6442 **LaserJet 4 (with toner)**—All NEW! True 600 x 600 dpi resolution with microfine toner. Forty-five internal scalable typefaces. Fast RISC processor. 2 MB memory and more **\$1499.**

Strategic Studies Group

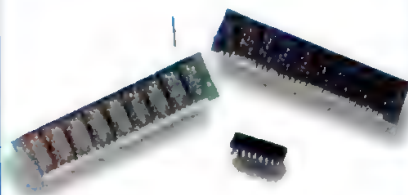
- 8444 □ Carriers at War 39.
- Toyogo**
- 5138 □ Go Master Deluxe 5.0 for Windows 99.
- 5143 □ Go Master Deluxe 5.0 99.
- Walt Disney Computer Software**
- 1162 □ Mickey & Friends Fun Pack 1.0 23.
- 2629 □ Mickey's 123's or 2624 ABC's ea. 29.
- 9984 □ The Animation Studio 1.0 72.

HARDWARE

Warranties listed next to manufacturer.

- 3 Com ... lifetime (conditional)**
- 3453 EtherLink II/16... 159. 3469 II/16 TP.. 169.
- American Power ... 2 years**
- 7108 Smart UPS 400 339. 7105 UPS 600 439.
- 3819 Back-UPS 250. 115. 3858 UPS 400 . 179.
- 7107 Back-UPS 450. 215. 3823 UPS 600 . 295.
- Appoint ... limited lifetime**
- 2489 Thumbelina PC or 2480 MousePen Pro PC 62.
- ATI Technologies ... 5 years**
- 9985 VGA Integra (1024 x 768, 16 colors)..... 84.
- 8463 VGA Wonder XL24 (with 1 MB)..... 149.
- 3886 Graphics Ultra + (with 2 MB)..... 339.
- 3871 Graphics Ultra Pro (with 2 MB)..... 519.
- 2382 Graphics Vantage VGA (with 1 MB)..... 225.
- 3902 StereoFX (sound board) 109.
- Boca Research ... 5 years**
- 7150 BOCARAM/AT PLUS (2 MB) 209.
- 7139 (4 MB) 319. 7138 (8 MB) 539.
- 8398 External 14,400 Baud V.32 FaxModem 275.
- 8397 Internal 14,400 Baud V.32 FaxModem 219.
- 6998 I/O Board for AT 49. 6999 for PS/2 89.
- 8380 BasicVGA 49. 8381 SuperVGA 115.
- Bravo Communications ... 2 years**
- 7400 2 Position Laser Compatible Switch Box 109.
- 7501 CPS1021 (electronic switch box)..... 135.
- Caere ... 1 year**
- 8158 Typist Plus Graphics 299.
- Canon ... 1 year**
- We are an authorized Canon Service Center.
- 7894 BJ-10ex Printer (4.6 lb.) 299.
- 7809 BJ200 Printer 369.
- 8940 BJ-C800 Color BubbleJet Printer 1899.
- 7897 BubbleJet Ink Cartridge (BJ-10ex) 23.
- Cardinal ... 1 year**
- 8690 MVP241 Modem Value Pack 39.
- 7667 MVP96IF FaxModem Value Pack 195.
- 8689 386SX-33 MHz Motherboard ØK 275.
- Chips & Technologies ... lifetime**
- 6137 SuperMath 387DX-25 55.
- 6138 387DX-33.... 65. 8388 387SX-33 84.
- CoStar ... 1 year**
- 1947 LabelWriter II 185.
- COVOX ... 1 year**
- 5543 Sound Master II 145.

and get your order



PC Connection ... 1 year

Bring out the power of Windows or any number of applications by boosting your memory.

5510 1 MB x 9 SIMMs (80 ns).....	call
2497 4 MB x 9 SIMMs (80 ns).....	call
5746 1 MB Chips (80 ns, set of 9).....	call

Kensington Microware ... 1 year

Full line available. Partial listing.

4973 PowerTree 20 (6 outlets, EMVRFI Filtering) \$24.	
2582 Master Piece Plus 95.	2587 Remote 105.
7899 Expert Mouse serial... 99.	7900 bus... 115.
3311 MasterStand	59.
Key Tronic ... 3 years	
4518 101 Plus Keyboard	99.
4387 Trak 101 Keyboard (with trackball).....	165.
KOSS Corporation ... lifetime	
5480 HD-1 set of speakers	25.
5459 HD-4 speakers with equalizer	49.
Logitech ... limited lifetime	
3996 Trackman2 (combo)	84.
2343 Trackman Portable	99.
7975 ScanMan 256	269.
1015 ScanMan Color	599.
3295 MouseMan (combo) 69.	9766 (cordless) 89.
MediaVision ... 3 years	
5637 ProAudio Spectrum 16	199.
8404 Thunder & Lightning	219.
7873 Fusion CD 16	499.
5638 MultiMedia PC Upgrade Kit 16	969.
6829 CDPC (CD, ProAudio 16 & speakers) ..	999.



Hayes ... 2 years

Accura 2400—High-performance, cost-effective 2400 bps modem with free Smartcom EZ software. The best value for genuine Hayes compatibility and performance.
9039 External... \$85. 9033 Internal... \$79.

Creative Labs ... 1 year	
8578 Sound Blaster	99.
2336 Sound Blaster Pro	189.
5770 Sound Blaster 16	229.
Curtis ... lifetime	
1708 Ruby-Plus SPF-2+	59.
7358 Command Center SPF-4	79.

Cyrix Corporation ... 5 years	
MATH COPROCESSORS	
9877 FasMath 83S87-16 (SX compatible)	69.
9875 FasMath 83D87-25 or 9876 83D87-33 ea.	69.

Diamond Computer ... 5 years	
8333 SpeedStar 24X Graphics Accelerator ..	175.
6945 Stealth Hi-Color	239.

Epson ... 2 years	
--------------------------	--

We are an authorized Epson Service Center

5555 AP-3250 (80 col., 200 cps, 24 pin).....	229.
7103 FX-870 (80 col., 380 cps, 9 pin)	319.
7153 FX-1170 (136 col., 380 cps, 9 pin)	409.
2358 LQ-570 (80 col., 252 cps)	289.
2361 LQ-870 (80 col., 330 cps)	489.
2357 LQ-1170 (136 col., 330 cps)	669.

Hauptpage Computer ... 1 year	
--------------------------------------	--

4008 WinTV	439.
------------------	------

Hayes ... 2 years	
--------------------------	--

9039 Accura 2400 external.. 85.	9033 int... 79.
---------------------------------	-----------------

7391 ULTRA 96 Modem	599.
---------------------------	------

5024 ULTRA 144 Modem	669.
----------------------------	------

1345 OPTIMA 24 Modem	125.
----------------------------	------

3522 OPTIMA 96 Modem	349.
----------------------------	------

8187 OPTIMA 24+FAX96	159.
----------------------------	------

7395 OPTIMA 144+FAX144	479.
------------------------------	------

9884 Pocket Edition 2400	119.
--------------------------------	------

Hewlett-Packard ... 1 year	
-----------------------------------	--

7620 DeskJet 550C (color) (with ink cart.)	789.
--	------

7621 DeskJet Portable (with ink cartridge)	439.
--	------

3957 LaserJet IIP Plus (with toner)	879.
---	------

6442 LaserJet 4 (with toner)	1499.
------------------------------------	-------

Intel ... 3 years	
--------------------------	--

3864 14.4EX Modem	469.
-------------------------	------

1086 Matched Memory Classic Memory Bnd. Ok.	95.
---	-----

5992 SatisFAXtion Modem 200	299.
-----------------------------------	------

5994 Modem 400. 399.	5995 Modem 400E 449.
----------------------	----------------------

5999 FAXability Plus (software)	79.
---------------------------------------	-----

6003 FAXability Plus OCR (software)	165.
---	------

2994 EtherExpress 16 or 3021 16 TP ea.	129.
---	------

6418 OverDrive Processor (for 486SX-25 MHz) ..	499.
--	------

8943 OverDrive Processor (for 80486DX-33) ..	669.
--	------

MATH COPROCESSORS	
--------------------------	--

4750 80387SX (all 80386SX CPU's)	79.
--	-----

5409 80387DX (all 80387DX CPU's)	85.
--	-----



Intel ... 3 years

Intel SatisFAXtion Modems—Fax from Windows or DOS as easily as you print. In 4 different performance ranges and prices. Now includes Faxability Plus software - thru 1/31/93... see line listings.

Megahertz ... 5 years	
------------------------------	--

6576 External 9600 Pocket FAX/Modem	479.
---	------

Microsoft ... lifetime	
-------------------------------	--

7597 Microsoft Mouse (bus or serial)	85.
--	-----

2898 Mouse with Windows 3.0 (bus or serial) ..	149.
--	------

1896 Ballpoint Mouse (serial only)	119.
--	------

MicroSpeed ... 1 year	
------------------------------	--

6007 PC-TRAC Trackball serial	75.
-------------------------------------	-----

Microtek ... 1 year	
----------------------------	--

5187 ScanMaker II	879.
-------------------------	------

5175 ScanMaker IIXE	1099.
---------------------------	-------

Mouse Systems ... lifetime	
-----------------------------------	--

3213 PC Trackball II (serial)	55.
-------------------------------------	-----

7878 PC Mouse III (serial)	69.
----------------------------------	-----

5427 NewMouse	62.
---------------------	-----

5979 NewPoint	62.
---------------------	-----

5978 PenMate	209.
--------------------	------

800-800-0004



PC Connection

6 Mill Street

Marlow, NH 03456

SALES 603-446-0004 FAX 603-446-7791



Video Seven ... 7 years

7362 WIN.VGA (1 MB)—Designed to optimize Windows performance, WIN.VGA provides hardware assist for BitBLT raster operations. Resolutions up to 1024 x 768 with 256 colors non-interlaced & flicker-free refresh rates \$129.

PC CONNECTION

© COPYRIGHT PC CONNECTION, INC., 1992. PC CONNECTION, PCTV AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH. ALL OTHER TRADEMARKS REMAIN THE PROPERTY OF THEIR RESPECTIVE COMPANIES.

by Christmas Eve!



IOMEGA ... 1 year

6343 PC Powered 90—Lowest priced Bernoulli drive ever in one complete, convenient package. Includes 90 MB cartridge, PC2B interface card, and cable..... \$499.
6344 PC Powered 90 PRO 599.

Practical Peripherals ... lifetime

8993	PM2400 Modem (internal, V.42bis).....	115.
8994	PM2400 Modem (external, V.42bis).....	125.
8132	PM2400 Pocket Modem	109.
5435	PM2400F (internal).....	59.
5437	PM2400F Pocket Modem	115.
5429	PM2400EFX SAV.42 bis (external).....	145.
5428	PM2400EFX V.42 bis (internal).....	139.
5436	PM2400F SA Mini (external).....	79.
2266	PM9600 Internal Modem.....	275.
7934	PM9600SA Modem	289.
2264	PM2400FX96 (internal modem/fax).....	95.
1344	PM2400FX96SA (external modem/fax).....	99.
9051	PM14400FX with WinFax Pro Bundle ..	379.
3803	PM14400FX96 (internal modem/fax) ...	359.
2425	PM14400FXSA (external modem/fax).....	399.

Prometheus ... 2 years

7776	Home Office Modem	215.
Solecetek ... 1 year		
4804	Pocket Fax Windows.....	189.
4769	Pocket LAN Ethernet.....	239.

Targus ... lifetime

1305	Universal Notebook (computer case).....	69.
------	---	-----

Technology Concepts ... 2 years

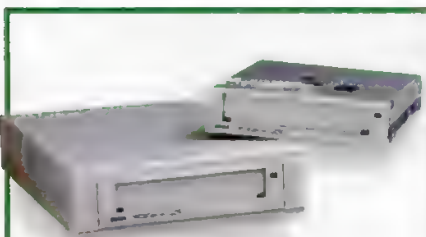
6315	Fax Line Manager 203	125.
------	----------------------------	------

TheComplete PC ... 2 years

6069	TheComplete Modem Plus	95.
8599	TheComplete Turbo Modem Plus (Ext.) ..	289.
8593	TheComplete Communicator Gold	479.

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, Gold Seal Warranty) ..	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty) ..	59.
6782	Isotel Ultra 8 Surge Suppressor w/let	69.



IOMEGA ... 1 year

Tape250—QIC & Irwin compatibility in one affordable tape drive! Stores 250M & includes data compression & Central Point Backup.
8480 Tape250 Insider Tape Backup..... \$239.
8481 Insider HII 259. 8482 PC Powered 359.

6807	OMNI 450 LAN Power Backup	\$279.
6797	OMNI 600 LAN Power Backup	369.
9312	BC500 Power Backup	219.
Video Seven ... 7 years		
7362	WIN.VGA 1 MB (1024 x 768, 256 color) ..	129.
Zoom Telephonics ... 7 years		
1307	Int. 2400 Baud w/9600 Baud Fax Modem ..	79.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem ..	92.
1494	Ext. 9600V.32bis... 195. 3075 Int. ...	195.
3574	Ext. 2400 Baud V.42/9600 Baud Fax ...	115.
3386	FaxModem AFC (2400 baud 96S/48R) ..	59.
4430	FaxModem AFX (2400 baud 96S/48R) ..	79.
4429	FaxModem V.32bis 14,400 baud (int.) ..	219.
4428	FaxModem V.32bis 14,400 baud (ext.) ..	259.
7921	Pocket FaxModem	87.

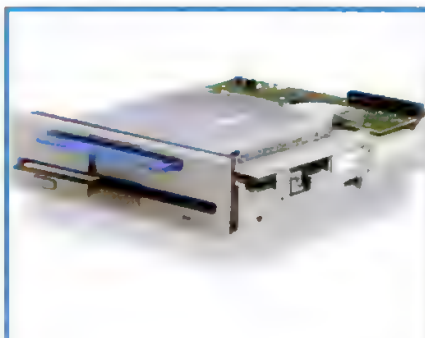
DRIVES

Colorado Memory Systems ... 1 year

4194	Jumbo 120 Tape Backup	199.
4354	Jumbo 250 Tape Backup	269.
1073	Trakker 250 Tape Backup (parallel).....	429.

Conner Peripherals ... 1 year

2339	CP30104H 120 MB IDE HD (19 ms).....	319.
1337	CP3204 200 MB IDE HD (16 ms).....	539.
3511	CP3544 500 MB IDE HD (12 ms).....	979.



TEAC ... 1 year

4414 3 1/2" Dual Floppy Drive—Get two drives in one. TEAC's new Dual Floppy Disk Drive gives you both 3 1/2" and 5 1/4" in one, saving you space and money... \$145.

IOMEGA ... 1 year

We are an authorized iomega Service Center.

9095	DC2120 preformatted tape cartridge.....	29.
9094	DC2120 Tripak	85.
6499	Transportable 90 PRO	679.
6502	Insider 90 PRO 579. 6501 Dual 90 PRO 1479.	
6343	PC Powered 90 (incl. PC2B & cart.).....	499.
6344	PC Powered 90 PRO (incl. PC2B, cartridge & Central Point Software).....	599.
2500	PC2B-2 Controller	149.
2530	90 MB Cartridge.. 149. 2467 Tripak ..	439.
8480	Tape250 Insider Tape Backup	239.
8481	Tape250 Insider Half-Height Tape Bckp ..	259.
8482	Tape250 PC Powered Tape Backup....	359.

NEC ... 2 years

6577	CDR37 Portable CD-ROM Drive	399.
6582	CDR74 Portable CD-ROM Drive	589.
6581	CDR84 for PC/XT/AT	599.
7023	MPC Upgrade Kit (with CDR37).....	949.
7021	MPC Upgrade Kit (with CDR84).....	1079.

Pacific Rim ... 1 year

1304	1.2 MB External (for any parallel port).....	239.
2761	1.44EX MB Ext. (for any parallel port).....	239.

Peripheral Land, Inc. ... 1 year

8736	Infinity Floptical Drive	399.
8735	Infinity 88 MB Removable (Syquest)....	699.

Quantum ... 2 years

8304	Plus Hardcard II XL 50 MB (9 ms).....	225.
8287	Plus Hardcard II XL 105 MB (9 ms).....	325.
4735	Hardcard E2 127 MB IDE (17 ms).....	349.
4714	Hardcard E2 240 MB IDE (16 ms).....	569.

Summit Memory Systems ... 2 years

6436	SE120 Tape Backup	\$215.
------	-------------------------	--------

TEAC ... 1 year

6951	1.2 MB Drive for AT	65.
4670	1.44 MB Drive for PC/XT (3 1/2")	59.
4328	1.44 MB Drive for AT (3 1/2", w/Bastech) ..	75.
4414	3 1/2" 5 1/4" Dual Floppy Drive	145.

MEMORY

6556	256k DRAMs (100 ns, set of 9).....	call
5510	1 MB x 9 SIMMs (80 nanosecond).....	call
2497	4 MB x 9 SIMMs (80 nanosecond).....	call
5746	1 MB Chips (80 ns, set of 9)	call

DISKS/MEDIA

Fuji ... lifetime

2214	3 1/2" DS Disks (10).... 9. 2242 (50).....	32.
7379	3 1/2" HD Disks (11)..... 18. 2241 (50).....	59.
7378	3 1/2" HD 11-Pack Preformatted Disks ...	16.
4863	3 1/2" HD Disks (20) w/storage case	28.

Sony ... lifetime

3292	5 1/4" HD Disks (Qty. 10)	11.
3297	3 1/2" DS Disks (10).... 9. 6148 (30).....	25.
3298	3 1/2" HD Disks (10).... 15. 6375 (30).....	42.
8185	QD2040..... 14. 1895 QD2120.....	21.

3M ... lifetime

3943	DC2000..... 17. 1581 DC2120.....	23.
------	----------------------------------	-----

Toshiba ... 2 years

4858	3 1/2" 2.88 MB ED Disks (Qty. 5)	28.
9755	3 1/2" 2.88 MB ED Disks (Qty. 10)	53.

OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$100 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- Corporate P.O.s accepted subject to approval.
- COD max. \$1000. Cash or cashier's check. COD orders require an additional \$4 charge.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice (e.g. SIMMs).
- Our order lines are open continuously from 8:00 a.m. Monday until 5:00 p.m. Sunday Eastern Time. You can call our business offices at 603-446-3383 Monday through Friday 9:00 a.m. to 5:30 p.m. Eastern Time.

SHIPPING

Continental U.S.: The total freight charge on any order placed with PC Connection is only \$5. Barring events beyond our control, all credit card orders phoned in weekdays by 3:00 a.m. Eastern Time will ship Airborne Express for delivery the next business day. Which means same day delivery for orders placed between midnight and 3:00 a.m. Eastern Time. (Some orders may ship by UPS Ground for next day delivery). Saturday delivery available to many areas upon request at no additional charge. Order all day Saturday through noon on Sunday for Monday delivery. (Some areas require an additional day delivery).

Hawaii, Alaska, Canada, Puerto Rico and the U.S. Virgin Islands: Call 800-800-0004 for information on shipping and charges.

All other areas: Please call 603-446-0004 or FAX 603-446-7791 for information.



Are you ready to test our medal?

We always go for the gold up here in the over-achieving village of Marlow, NH (pop. 602). Whether it's shipping overnight until the last possible minute, or finding the answer to a difficult technical question, we'll do whatever it takes to make buying PC products fast and easy. So we're pleased as punch (and twice as sparkling) to learn that we were once again voted the people's choice for Best Mail-Order Company in the *PC World* 1992 World Class Awards!

Order until 3:00 a.m. Dec. 24th!

Amazing, huh? We've earned our World Class awards thanks to service breakthroughs like Everything Overnight,[®] (just \$5 for all orders in the continental U.S.). Which comes in particularly handy during that last-minute Christmas shopping. Call by 3:00 a.m. ET on December 24th and if your order is in stock we'll put it on an Airborne plane by 4:00 a.m. You may actually get your PC gift before the crowded malls open that very morning! But, in any event, it should arrive in plenty of time to put it under the tree. Happy Holidays!

PC CONNECTION[®]

©COPYRIGHT 1992 PC CONNECTION, INC. PC CONNECTION, WHICH, ALONG WITH MACCONNECTION AND NEXTCONNECTION, IS JUST ONE OF SEVERAL DIVISIONS OF PC CONNECTION, INC.)
EVERYTHING OVERNIGHT AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH

Like many of the tested systems, the Qtech uses an S3 911-based graphical user interface accelerator card—in this case, the STB Wind/X. As with other such boards, DOS video performance was well below average, and even Windows graphics performance—in line with the low memory score—was below par. Quill includes a 14-inch Tatung monitor with a 60-Hz refresh rate at 1,024-by-768 noninterlaced resolution.

The Qtech uses an S3 911-based graphical user interface accelerator card, the STB Wind/X.

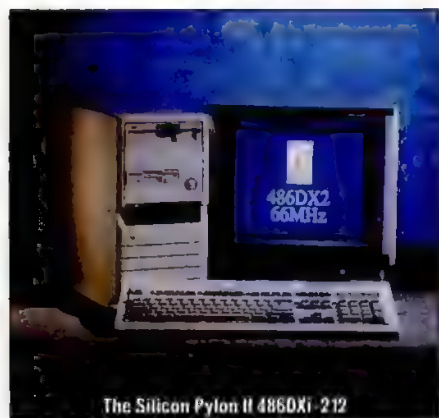
In addition to DOS and Windows, Quill tosses in a choice of either Quattro Pro for DOS 4.0 or Quattro Pro for Windows 1.0.

The company offers a one-year parts-and-labor warranty, with free on-site service the first year. But the price may be steeper than it looks, since Quill sells direct and offers few dealer discounts.—JQ

Silicon Valley Computer
Pylon II 486DXi-212

Although Silicon Valley Computer's \$2,895 Pylon II 486DXi-212 is a well-designed and well-priced ISA tower, it garnered mixed scores on our testing routines. Its best showing was its processor performance, which ranked in the top quarter of our review group.

The system comes in a mini-tower case that lets you easily place it on or beneath



The Silicon Pylon II 486DXi-212

your desk. Its construction and assembly are clean and solid. However, the relatively small case limits room for expansion, and three of the ISA slots are confined to half-length cards because of the

FACT FILE

Pylon II 486DXi-212
Silicon Valley Computer,
441 N. Whisman Rd., Bldg. 13,
Mountain View, CA 94043; 415-967-1100;
fax, 415-967-0770

List Price (tested configuration): \$2,895.
Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache.
Disk drives and controller: Conner 12-ms 212MB IDE hard disk, Silicon Valley Computer ADP70 controller, 1.2MB and 1.44MB floppy disk drives.
Display: Paradise 1,024-by-768 adapter with 1MB RAM and Western Digital WD90C31 chip set, Silicon Valley VC14-10 14-inch monitor with 72-Hz refresh rate at 800-by-600.
Software: DOS 5.0, Microsoft Windows 3.1.
In short: This Silicon Valley Computer entry has an attractive price, but it garnered mixed scores on our testing routines. It turned in a good processor score, however, and the well-built case shows solid construction.

 ON READER SERVICE CARD

placement of the drive bays.

The Pylon's motherboard has 256K of 15-nanosecond static-RAM cache, with a two-way set-associative architecture and a write-back write policy. Good cache design helped the processor score hover just below those of the top performers, but the Pylon's memory performance was in the bottom half of the pack.

Unfortunately, those in search of a robust Windows performer will be disappointed. The unit's Western Digital Paradise Accelerator video adapter, with a WD90C31-LR controller, typically does well in testing under DOS but lags behind

SUITABILITY TO TASK				
Pylon II 486DXi-212				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

the graphics accelerator cards under Windows.

The 212MB Conner IDE hard drive, usually a consistent performer, managed to produce a DOS disk score that ranked in the lower half of the group, and the Windows disk score also dropped below the mean. Silicon Valley Computer also installs Western Digital drives.

SVC is oriented more toward corporate than individual sales. It does not maintain an 800 number since it sells mostly through dealers and PC coordinators, who handle technical support. SVC offers a one-year warranty on parts and labor; Computer Service Network handles on-site service and will quote a price.—JQ

Sirius Systems Technology Inc.
SST 486DX2-66MWC

At the low cost of \$2,800, the Sirius Systems Technology entry still managed to hold its own against systems using more advanced (and expensive) technology.

From the outset, the SST 486DX2-66MWC gives a middle-of-the-road impression. The case, a standard desktop, is the standard Phillips screwdriver affair, with four drive bays—three of which are accessible. Inside, you'll find a typically configured ISA motherboard. All primary components, such as the processor and system BIOS, are integrated (instead of being mounted on proprietary plug-in cards for easy upgradability, as they are on some of the more expensive models).



The SST 486DX2-66MWC

And there is a 256K external static-RAM cache—but it isn't easily upgradable either. Although SST's motherboard does have everything you need and is laid out well enough for most users, you can't call

COMPUTERS
486DX2/66s

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	○

it cutting edge. And some power users might be dismayed by its 32MB-maximum RAM capacity. The system's only real high point is its CTX monitor, which offers a nice picture and is programmable as well, with front-mounted digital controls.

A satisfactory assortment for well under \$3,000, the SST held up well enough under PC Labs' benchmark tests. Competing against systems with EISA and local-bus architecture and cached SCSI-2 hard disks, the SST managed near average test scores in every area except DOS video. Here, the 16-bit STB Wind/X video adapter managed the dismal DOS score that S3 graphical user interface accelerator cards usually help produce.

SST offers a one-year parts-and-labor

warranty, with on-site service thrown in at no charge. Though this is somewhat typical, it certainly isn't uncompetitive. If you are price driven, you might want to give this one a look.—*OR*

Standard Computer Corp.

Standard Windows Workstation Plus

Founded in 1984, Standard Computer Corp. is a company with a deserved reputation for selling fully configured quality systems at competitive prices. Its \$3,845 EISA Standard Windows Workstation



The Standard Windows Workstation Plus

Plus is just another example of this philosophy. The unit's standard desktop case has plenty of room for expansion and a motherboard that places the processor, oscillator, and external cache on a proprietary plug-in card for easy upgradability. This is about as technically outgoing as Standard gets. The rest of the system is comprised of proven components, such as the ATI Graphics Ultra video card and a popular Quantum 240MB IDE hard disk.

However, all these name-brand elements combined to produce only average or below-average marks on PC Labs' benchmark tests. The system logged the second-lowest DOS processor score in

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	●	○

FACT FILE

Standard Windows Workstation Plus

Standard Computer Corp., 12803 Schabarum Ave., Irwindale, CA 91706; 800-662-6111, 818-337-7711; fax, 818-960-2926

List price (tested configuration): \$3,845.

Memory and processor RAM cache: 8MB 70-ns RAM, 256K cache.

Disk drives and controller: Quantum LPS 240 14-ms 240MB IDE hard disk with internal 256K cache, DTC multifunction controller, 1.2MB and 1.44MB floppy disk drives.

Display: ATI Graphics Ultra 1,024-by-768 adapter with 1MB VRAM, MAG MX-15 monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS, Microsoft Windows 3.1, Norton Desktop for Windows 2.0, and your choice of Ami Pro 3.0, Borland C++, Borland Turbo Pascal for Windows 1.5, Freelance Graphics, Generic CADD 6.0., Lotus 1-2-3 for Windows, or Paradox 4.0

In short: Standard Computer's entry offered below-average performance, but it includes a hefty software bundle

 ON READER SERVICE CARD

the test group.

However, performance is not what Standard is relying upon in order to attract more customers. The company is aiming to sell its Windows Workstations

*All the name-brand
elements of the Standard
system produced only
average marks.*

by bundling as much free equipment as possible, including the excellent MAG MX-15 programmable monitor, DOS 5.0, Windows 3.1, Norton Desktop for Windows 2.0, and your choice of Ami Pro 3.0, Borland C++, Borland Turbo Pascal for Windows, Freelance Graphics, Generic CADD 6.0, Lotus 1-2-3 for Windows, or Paradox 4.0.

Add to that a two-year warranty on parts and labor, with the first year including free on-site service from Idea Serv-Com, and you've got yourself quite a competitor.—*OR*

FACT FILE	
SST 486DX2-66MWC	
<i>Sirius Systems Technology Inc., 4344 Young St., Pasadena, TX 77504; 800-424-0724, 713-946-0724; fax, 713-946-5451</i>	
List price (tested configuration): \$2,800	
Memory and processor RAM cache: 8MB 70-ns RAM, 256K cache	
Disk drives and controller: Western Digital Caviar 2200 IDE 212MB hard disk with internal 64K buffer, SST controller, 1.2MB/1.44MB combination floppy disk drive.	
Video: STB Wind/X adapter with S3 chip set and 1MB DRAM, CTX 1560 monitor with 72-Hz refresh rate at 1,024-by-768	
Software: DOS 5.0, Microsoft Windows 3.1, Cache86, PreCursor, Tree86	
In short: On PC Labs' benchmark tests, SST's low-cost ISA entry managed to hold its own against systems that used costlier and more advanced equipment. But those seeking cutting-edge technology or modular upgradability of key components may find this system's last-generation design and occasional hardware limitations unattractive.	
 ON READER SERVICE CARD	

COMPUTERS

486DX2/66s

Swan Technologies Inc.

Swan 486DX2-66DB

Although the Swan 486DX2-66DB ships with a beautiful 17-inch Magnavox monitor, the rest of the unit offers nothing special, yet its price of \$4,684 was one of the highest here. While many of the above-\$3500 prices we saw were restricted to machines with expensive EISA motherboards, the Swan came equipped with an ISA bus. All in all, the Swan gives the impression of a computer fighting to be competitive but falling short in several



The Swan 486DX2-66DB

important respects.

At first glance, however, you may be impressed. Open this Swan's case, and you'll find a powerful Hewlett-Packard SCSI-2 318MB hard disk and local-bus technology. Too bad neither the HP disk nor the S3-based proprietary local-bus video performed well on our DOS disk and video test routines. Incidentally, Swan plans to market a VESA-compliant system by the time you read this. If true, this could change its video performance.

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	●	●

But even with this caveat, the Swan continued to flounder. The 486DX2/66, on its own plug-in processor card, performed at a mediocre level, while the 128K external static-RAM cache was apparently overwhelmed. At least the level of integration was competitive: You

won't find any 8-bit I/O cards clogging up this PC's interior, and the processor plug-in card should at least make for an easy upgrade. Flash-upgradable BIOS instead of the socket mount found here would have made it even easier, however.

As mentioned, the unit is graced by an excellent Magnavox monitor. It sup-

FACT FILE

Swan 486DX2-66DB

Swan Technologies Inc., 3075 Research Dr.,
State College, PA 16801; 800-554-6745,
814-234-2236; fax, 814-237-4450

List Price (tested configuration): \$4,684.

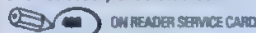
Memory and processor RAM cache: 8MB 70-ns RAM, 128K cache.

Disk drives and controller: Hewlett-Packard 12-ms 310 MBs SCSI-2 318MB hard disk, Adaptec controller, 1.2MB and 1.44MB Chiron floppy disk drives

Display: Swan 4DB local-bus adapter with S3 chip set and 1MB RAM, 17-inch Magnavox CM9217 monitor with 70-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, Keyfonts for Windows

In short: Even with a large SCSI-2 hard disk and local-bus video technology, the ISA Swan entry didn't manage to distinguish itself enough to justify its cost, one of the highest in this roundup. Disk and video test scores were at best unremarkable, and a small 128K external cache didn't help performance either. Even with an attractive warranty, this system is overpriced and noticeably understocked



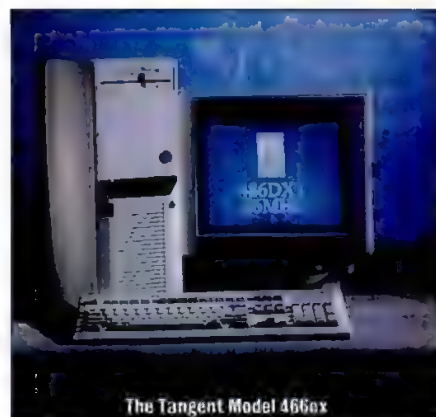
ports up to 1,280-by-1,024 resolution on its large clear screen, sports easy-to-use front-mounted controls, and accepts a wide range of video modes across its high-performance bandwidth.

Swan offers a two-year parts-and-labor warranty, with the same two years serviced on-site for free. If you can get a better deal than the price quoted here, this is a computer worth examining.—OR

Tangent Computer Inc.

Tangent Model 466ex

Tangent Computer has a solid reputation that its new 466ex will certainly live up to. Though its \$3,966 price isn't the cheapest, Tangent is offering a lot for your hard-earned buck, including an EISA bus, SCSI-2 storage, fast graphics,



The Tangent Model 466ex

and even a 15-inch flat-square monitor on which to view them.

Though it's got an attractively styled case, the inside of this computer is where the action is. Tangent's new motherboard is made by Micro Center, which certainly cut few—if any—corners. It can handle up to 128MB of RAM, and contains six EISA slots, two 16-bit ISAs, and a processor socket that Tangent touts as upgradable. But since it only supports 486 processors, there won't be much room to upgrade if you buy this model. Also, we would have liked to have seen the I/O ports integrated and maybe some

FACT FILE

Tangent Model 466ex

Tangent Computer Inc., 197 Airport Blvd.,
Burlingame, CA 94010; 800-800-6060,
415-342-9388; fax, 415-342-9380

List price (tested configuration): \$3,966.

Memory and processor RAM cache: 8MB 60-ns SIMMs, 256K external SRAM cache.

Disk drives and controller: Maxtor 13-ms LXT-340 SCSI-2 340MB hard disk, Tangent Disk Wizard EISA SCSI host adapter with 4MB cache, 1.2MB/1.44MB combination floppy disk drive.

Display: Diamond SpeedSTAR 24X ISA graphics adapter with a Western Digital 90C31 chip set and 1MB RAM, Taxan 550 monitor with 70-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Though slightly expensive, Tangent's new design offers excellent features, such as SCSI-2 hard disk storage, a remarkable new disk controller, fast graphics performance, and a 15-inch flat-square monitor. Performance matched, making this a system to consider.



Unleash the power of data compression for Windows!



**Includes
Data & Image
Compression
For Windows**



SuperStor PRO™ is simply the most advanced data compression product available. It's the FIRST real-time data compression product to bring you a Windows™ interface and JPEG color image compression. It also has password protection, an integral disk cache, improved performance, and a mountain of other features for users with Windows, graphics, and DTP requirements. Get the bigger picture by calling us today at 1-800-732-3133 (or fax at (415) 688-0466).

addstar

AddStar, SuperStor, SuperStor PRO, and UDE are trademarks of AddStar, Inc. © 1992 AddStar, Inc. All rights reserved. All other products are trademarks of their respective owners.

Feature Comparison

	SuperStor PRO \$149.95	SuperStor V2 \$99.95	Stacker 2.0 \$149.00
Defragment	✓	✓	✓
Diagnostics and Repair	✓	✓	✓
Convert Uncompressed Drives	✓	✓	✓
Floppy Disk Support	✓	✓	✓
Integral Disk Cache	✓	✓	✓
Automount	✓	✓	
Menu-Driven Interface	✓	✓	
Universal Data Exchange (UDE)	✓	✓	
Consolidate	✓	✓	
Recompress	✓	✓	
Data & Image Compression for Windows	NEW!		
Optibase JPEG Image Compression	NEW!		
Improved Performance	NEW!		
Extended UDE Support	NEW!		
Password Protection	NEW!		
Tune-Up Analyzer	NEW!		
Compression Preview	NEW!		
Deinstall	NEW!		

**SuperStor
Version 2
now only
\$99.95!**

IMAGE OF THE READER SERVICE CARD

SUITABILITY TO TASK

Tangent Model 486ex

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	●
Windows applications	●	●	●	●
Expandability	●	●	●	●

VESA-compliant local-bus technology. But the name-brand add-in components Tangent used add up to a powerful system. One of the EISA slots is taken by Tangent's new Disk Wizard controller. Though its name sounds a little like something you'd find in Toys 'R' Us, this intelligent caching SCSI controller worked some wondrous magic on PC Labs' benchmark tests.

Under DOS, the Disk Wizard and the Maxtor hard disk combined for top marks, though Windows performance was dismal. Processor and memory scores were exceptional. The Diamond SpeedSTAR 24X (based on the powerful Western Digital 90C31 chip set) graphics adapter managed good marks too. All around, this was a thoroughbred performer.

Tangent's warranty policy is adequate, with one year on parts and labor and the same year covered on-site by TRW.—OR

Tri-Star Computer Corp.

Tri-Star 66/DX2-VL

Yet another vendor using the renowned Micronics VL-Bus motherboard, Tri-Star Computer Corp. attempts to differentiate its \$3,569 66/DX2-VL from the rest of the test field with a spacious tower case and a 17-inch Hitachi monitor.



The Tri-Star 66/DX2-VL

The tower case is a boon for those who expect to spend time customizing or expanding the system. The Micronics motherboard is almost totally accessible, and there are plenty of easy-to-reach drive bays. An added bonus is a Logitech mouse, which comes with the unit.

Differentiating systems that are based

FACT FILE

Tri-Star 66/DX2-VL

Tri-Star Computer Corp., 120 S. Weber Dr.,
Chandler, AZ 85226; 800-678-2799,
602-961-3401; fax, 602-961-4010

List price (tested configuration): \$3,569.

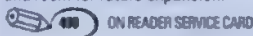
Memory and processor RAM cache: 8MB 70-ns
SIMMs, 256K cache.

Disk drives and controller: Maxtor LXT340A 15-ms
340MB IDE hard disk with internal 32K buffer, inte-
grated IDE controller, 1.2MB and 1.44MB floppy
disk drives.

Display: ATI Graphics UltraPro adapter with 68800
chip set and 2MB DRAM, Hitachi CM-1785 17-inch
monitor with 72-Hz refresh rate at 1,280-by-1,024

Software: DOS 5.0, Microsoft Windows 3.1..

In short: Tri-Star's use of the Micronics VL-Bus moth-
erboard and ATI's Mach 32-based Graphics UltraPro
adapter is accentuated by a fine-looking 17-inch Hitachi
monitor. Though the unit turned in some mixed per-
formance results, it manages to compensate somewhat
with a spacious tower case, plenty of storage space,
and room for future expansion.



around the same processor is difficult. For this roundup, many companies (such as Lightning Computer, whose entry was very similar to the Tri-Star machine) chose to upgrade the hard disk from IDE to SCSI. Tri-Star, on the other hand, chose to enhance its already excellent video subsystem with an excellent Hitachi 17-inch multi-scanning monitor. This gem gives you front-mounted analog controls, a 100-MHz bandwidth, a gorgeous picture, and even low ELF and VLF

emissions. Other than this, the two units are basically the same, with ATI's VESA-compatible local-bus implementation of ATI's Graphics UltraPro adapter, a muscular maximum of 64MB of RAM, and the ubiquitous 256K external static-RAM processor cache.

Even with this emphasis on video performance, however, Tri-Star's version of the local-bus ATI UltraPro graphics adapter came up short on our DOS video test routines. Under Windows, however, the unit turned in its expected high graphics score. DOS processor and memory scores were average, while the unit's IDE hard disk score was dismal under DOS and above average under Windows.

Tri-Star offers a two-year parts and lifetime labor warranty, with free first-year on-site service from TRW.—OR

Twinhead Corp.

Twinhead Superset 600/462D

Since nothing hurts attractiveness as much as poor performance, shoppers may find the Twinhead Superset 600/462D less than beautiful. Priced at \$2,999, it lacks some features that other machines reviewed here offer, such as a 300MB or larger hard disk, a dual floppy disk drive, a 256K external processor cache, and a graphical user interface accelerator.

What it does have is a very compact



The Twinhead Superset 600/462D

motherboard that integrates the pass-through VGA electronics and the I/O ports, mouse, and PS/2 keyboard ports. One slot can hold a daughterboard that provides four more expansion slots. The location of this board, however, blocks the CPU—which does not have a heat sink—from the fan (a heat sink on the

SUITABILITY TO TASK

Tri-Star 66/DX2-VL

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	●
Expandability	●	●	●	●

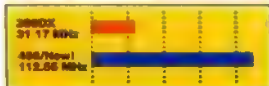
A PC IS A TERRIBLE THING TO WASTE.

IBM PS/2 Models 70 & 80 and Compaq Deskpro 386 systems have a future with 486/Now! processor upgrades.

Every year or so, a new version of your favorite software comes out. Ideally, the updated version is easier to use, has new features and hopefully makes you more efficient. To get the most from these improvements, you need 486 processing power. Until now, your only solution was to buy a whole new system. In addition to the cost, this meant re-installing software and buying new peripherals.

Don't Replace the System— Simply Upgrade the Processor.

A better alternative is to upgrade only the processor. 486/Now! from Kingston is a great way to get the processing power you need for business applications, network file



servers, graphics programs and CAD/CAM. 486/Now!

is available with either a 486DX 33MHz or a 486SX 25MHz, and has an on-board clock for optimum processor performance.

The Solution For 286 Systems.

SX/Now! is a great way to upgrade 286 systems from

IBM, Compaq, AST, HP, Epson, NEC, Toshiba

and Zenith to a Windows and

OS/2 ready  Am386SX, the

fastest 386SX available. SX/Now!

features 16kb of fast cache memory,

supports a 387SX co-processor and

has an on-board clock.

Easy Installation, Compatibility, Unquestioned Reliability.

Kingston processor upgrades plug directly into the system board, won't



interfere

with bus slots and take only about

ten minutes to install. They're

guaranteed fully compatible with both the systems for which they were designed,

plus all popular operating systems and applications.

486/Now! and SX/Now! carry five-year warranties.

For the power you need and the reliability you expect, call Kingston at (800) 835-6575 for more information or the name of a reseller near you.

Comparison of native Compaq Deskpro 386/20e and same system with 486/Now! 486DX-33MHz Landmark Speed Test 2.02. Comparison of native IBM PS/2 Model 50 and same system with SX/Now! 386SX-33MHz Landmark Speed Test 2.03. All trademarks are of their respective owners.



THE INSIDE NAME IN UPGRADES

17600 Newhope Street, Fountain Valley, California 92708 (714) 435-2600 Fax (714) 435-2699

COMPUTERS
486DX2/66s

CPU would block an expansion slot). Although the motherboard has most components integrated on it, adding more than one card might cause bottlenecks under heavy usage. The case has two external 5.25-inch bays and one internal 3.5-inch bay, which holds the hard disk. All

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

the bays are very easy to reach.

The 212MB Maxtor IDE hard disk with a 64K cache did poorly on our DOS and Windows disk test routines, landing near the bottom of the pack.

With only a 64K external cache, the Twinhead's processor scores were severely hampered. (A larger external cache is available as a system option.) Memory scores did not improve the system's standing any further, landing it in the middle of the pack.

The Twinhead's video controller

failed to add sparkle. Its motherboard-based Cirrus Logic controller with 1MB of RAM isn't known for its speed, and its benchmark test results did not change this. DOS video results were acceptable, but Windows performance lagged.

The unit comes with a good user manual (it's clear enough for novices to understand), a standard one-year warranty on parts and labor, and a year of free on-site service.—*JQ*

USA Flex Inc.
Flex 486DX2/66

USA Flex's \$3,799 Flex 486DX2/66 is a standard tower implementation of the DX2/66 processor and an eminently average piece of equipment that turned in mediocre performance scores.

The Flex's tower looks as if it might give great accessibility, but it contains only five 5.25-inch drive bays. Several standard desktop systems offer that many, and most towers offer more. Even with this dearth of expansion room and



The USA Flex 486DX2/66

an ASSY Baby EISA 346 motherboard design, USA Flex was unable to keep the motherboard accessible; the CPU and its heat sink are concealed by the bay assembly. Even the SIMM banks are quite difficult to reach because of a center-mounted metal bracket that supports the hard disk. The motherboard has no inte-

SUITABILITY TO TASK				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

FACT FILE

Flex 486DX2/66

USA Flex Inc., 471 Brighton Dr.,
Bloomington, IL 60108; 800-876-5608, 708-
351-9700; fax, 708-351-7204

List price (tested configuration): \$3,799

Memory and processor RAM cache: 8MB 70-ns
SIMMs, 256K cache

Disk drives and controller: Seagate ST3283N 12-
ms 248MB SCSI hard disk, Adpatec AHA-1740/42A
controller, 1.2MB JPN and 1.44MB Sony floppy
disk drives

Display: Diamond Stealth adapter with 1MB VRAM,
MAG FlexVision D1-1448 monitor with 60-Hz refresh
rate at 1,280-by-1,024.

Software: DOS 5.0, Microsoft Windows 3.1.

In short: Mediocre in both price and performance, the
Flex 486DX2/66 takes full advantage of neither its
tower case nor its EISA bus architecture. It is comprised
almost entirely of components that range from average
to slightly less than competitive and should attract only
those able to negotiate a lower price.



ON READER SERVICE CARD

grated components—such as video or I/O ports—which is acceptable in a large tower design. But though these components are handled by typical expansion cards, only the drive controller is an EISA. Video is handled by an ISA-based Diamond Stealth adapter with 1MB of video RAM, which is disappointing considering this system's list price and the fact that you're paying a premium for the EISA architecture any

way. Even the 248MB Seagate hard disk was a little smaller than many of the drives in competing products. Finally, even the MAG Flexvision D1-1448, though a decent product, is not the excellent MX15 for which MAG is justly famous.

Performance was disappointing too. Across all our test routines, except for our Windows disk suites, the product scored below average. It suffered from especially low processor and DOS video test scores—the latter undoubtedly due to the S3 GUI accelerator mounted on the Diamond Stealth card.

USA Flex offers a one-year parts-and-labor warranty, with free first-year on-site service from Dow Jones.—*OR*

FACT FILE

Twinhead Superset 600/462D

Twinhead Corp., 1537 Centre Pointe Dr.,
Milpitas, CA 95035;
800-995-8946, 408-945-0808;
fax, 408-945-1080

List price (tested configuration): \$2,999

Memory and processor RAM cache: 8MB 80-ns
SIMMs, 64K cache.

Disk drives and controller: Maxtor 7213AT 16-ms
212MB IDE hard disk, integrated IDE controller, 1.44MB
Chinon floppy disk drive.

Display: Cirrus Logic integrated controller with 1MB
of RAM, Relisys 14-inch monitor with 70-Hz refresh
rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1.

In short: While its system-board integration and war-
ranty support appear enticing, the Twinhead Superset
lacked top-notch performance. The 64K external
cache kept processor and memory scores down
and slowed graphics performance under Windows
as well



ON READER SERVICE CARD



NEW BREED





486SX/33-\$1999

This Hyundai 486SX-33 can out-muscle those barnyard bovines of cow country. But you be the judge.

Our 32 Megapixel "Longhorn" Local Bus?... or a 1 Megapixel moo cow? Our "faster-than-a-blink" Windows accelerator video processing tied to the speed of your 486 CPU?... or an old-fashioned bottleneck? Our 1MB VRAM controller producing 1024 x 768 ultra-high, non-interlaced resolution?... or their tired cow VGA? Clearly, the prize goes to the Hyundai New Breed.

Compare our standard 128KB of zero-wait state cache with non-cached cows. And don't forget, the Hyundai 433S flexes its processing muscle up to 256KB of cache expansion. This system runs at the head of the stampede!

And we don't just drive the Hyundai stampede, we overdrive it! Double your speed by simply snapping in the Intel Overdrive™ Processor. And our advanced "warp-speed" L2 cache and "Longhorn" Local Bus graphics engine give your upgraded system the 32-bit video and fast SRAM you'll need for your higher-speed 486 CPU.

Hyundai 433S

- 33MHz 486SX w/ 8KB integrated cache
- 32-bit VESA local bus UVGA graphics w/1MB VRAM
- 128KB "warp-speed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Upgradable to 486DX power via Intel Overdrive™ socket
- 4MB system memory expandable to 64MB on system board
- 170MB 19ms IDE HDD, 32KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs, (2.88MB-ready FDD interface)
- 14" non-interlaced, ultra-high resolution, .28 dot pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt and swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 expansion slots, including 1 VESA local bus slot
- 200 watt power supply
- 101 keyboard, 2 button mouse
- Built-in virus protection, front keylock, 2 level password
- MS DOS 5.0 and MS Windows 3.1



Hyundai 433S

Want to talk add-ins? We test our 486 systems with literally hundreds of industry-standard cards and software applications. We test software compatibility on Novell (we're fully certified and a Novell Alliance Program member), Banyan Vines, OS/2 2.0, LAN Manager, and SCO UNIX, plus hundreds of programs running under Windows and MS DOS.

Trouble on the data frontier? Relax. The Hyundai 433S is loaded. A beefy 170MB superfast hard disk, two floppy drives, five external/two internal drive bays, and seven expansion slots mean you won't go hungry for performance. And dressed up with our 14" flicker-free, non-interlaced, color display, the New Breed 433S is the new king of PC country.



Add-In

HYUNDAI

PCs designed and built in America

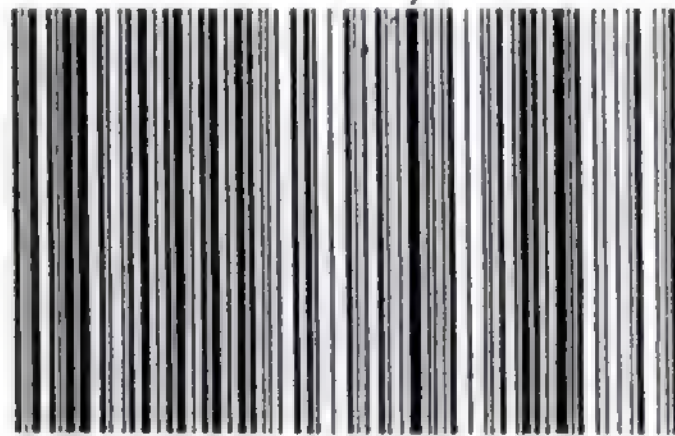
FOR DIRECT SALES

1-800-933-3445

1. Follow instructions on the other side

Back

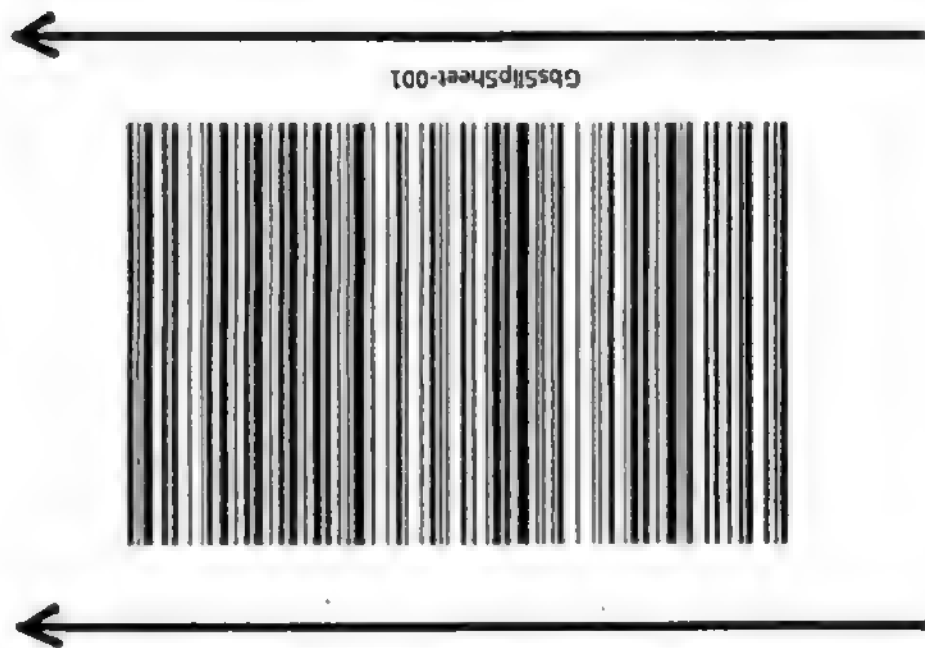
GbslipBack-001B



Inverted Back

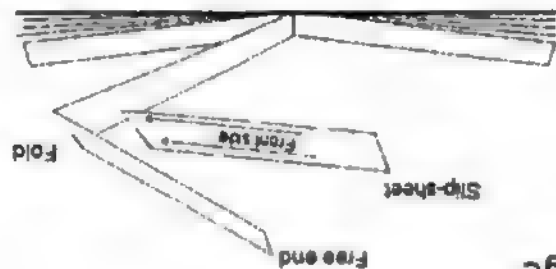
1. Follow instructions on the other side

Folded edge of the page



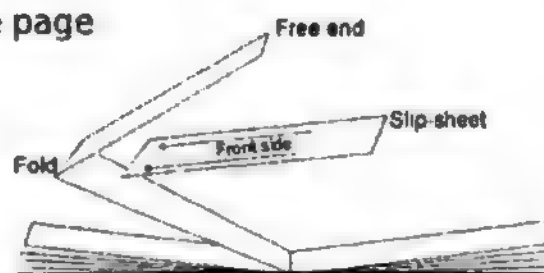
Inverted Foldout slip-sheet

Foldout slip-sheet



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



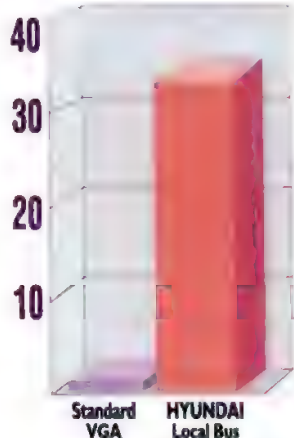


486 STAMPEDE



That thunder you hear on the PC prairie is the New Breed Hyundai 486 stampede. The hardest-charging, price-lean, MIPS-mean herd of computers you'll ever see. We're bringing everything from powerful 66MHz 486DX2 machines to Overdrive-Upgradable 486SX-25 computers. And with our 50MHz 486DX2 desktop PC and 486DX-33 blasters, you can handle today's demanding applications.

WINMARKS



Do something "Longhorn" Local Bus.

That flash you see on the graphics horizon is the image of our Windows processing power triggering the Hyundai 486 stampede.

Your 486 processor was meant to run today's applications. So why rein in all that power? That out-to-pasture, 16-bit VGA card can only deliver 2 Megapixels at best. That's already dated technology. Let her rip with 32-no-blink-bits of "Longhorn" Local Bus video acceleration. And with up to 32 Megapixels standard, believe it, you'll see an incredible difference in Windows performance.

Do something thunderbolt.

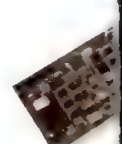
Lightning-fast "warpspeed" L2 caching is another max-performance feature that's designed into every Hyundai 486. Thunderbolt write-

back operations blast your DOS, Windows, or OS/2 data into a box canyon of ultra-fast SRAM. Start out with 128KB standard (more than the cow computers), then expand to 256KB to handle today's big applications. Cache hit for cache hit, the Hyundai 486 Family, with 128KB standard caching, delivers twice the MIPS of non-cached cows.

Do something upgradable.

The Hyundai 486 New Breed Family is designed in Silicon Valley, U.S.A., to out-perform the herd. All of our systems are CPU-upgradable through a single chip via a ZIF or Overdrive socket, so the New Breed lets you double your speed. We won't let tomorrow's 32-bit operating systems blast a hole in your productivity. Just upgrade your Hyundai 486 to any higher-speed Intel 486 CPU in the future.

32 BIT
VESA
LOCAL BUS
GRAPHICS



AND PUT THE OLD BREED OUT TO PASTURE.

Every cow has its day. But it's time to put that milker out to pasture and make way for the Hyundai 486 stampede. It's time to Do Something New Breed®.

Say goodbye to "cow-shed" engineering and mother-board-of-the-month manufacturing. At Hyundai, we're doing *U.S.-based, end-to-end, value engineering and manufacturing*. That means benchmark-blasting power from the new Hyundai family of 486 Systems.

And with up to 32 Winmarks of Windows processing power, Hyundai's bulletproof, 32-bit 486 Systems are designed and engineered for your high-throughput applications. For instance, *Local Bus Graphics* are standard on every system, from our entry-level computers up through our top-of-the-line desktops. You'll tear through Windows with our razor-sharp, 32-bit processing. Plus, up to 32 Megapixels of mind-bending *GUI acceleration* is standard with every New Breed 486 from Hyundai. And here's more New Breed value engineering. Our expandable, "warpspeed" *L2 cache architecture* is standard on every Hyundai 486 system.

Made-in-America engineering excellence is coming through the gates with the backing of a global high-tech leader. Now Do Something New Breed. And turn the page....





Somewhere east of Sioux City



POWERFUL



\$1799 Hyundai 425S

- 25MHz Intel 486SX w/8KB integrated cache
- 32-bit VESA Local Bus VGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Upgradable to 486DX power via Intel Overdrive™
- 4MB system memory expandable to 64MB on board
- 80MB 17ms IDE HDD, 32KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs

- 14" non-interlaced, ultra-high resolution, .28 dot pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt-and-swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 slots incl. 1 VESA Local Bus slot
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and MS Windows 3.1
- Other hard drive, video, memory, and monitor options available



\$2369 Hyundai 433D

- 33MHz Intel 486DX w/8KB integrated cache
- 32-bit VESA Local Bus VGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Processor upgradable via ZIF socket
- 4MB system memory expandable to 64MB on board
- 200MB 12ms IDE HDD, 256KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs
- 14" non-interlaced, ultra-high resolution, .28 dot

- pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt-and-swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 slots incl. 1 VESA Local Bus slot
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and MS Windows 3.1
- Available in floor-standing server model as 433DT, call for price
- Other hard drive, video, memory, and monitor options available



\$2599 Hyundai 450D2

- 50MHz Intel 486DX2 w/8KB integrated cache
- 32-bit VESA Local Bus VGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Processor upgradable via ZIF socket
- 8MB system memory expandable to 64MB on board
- 200MB 12ms IDE HDD, 256KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs

- 14" non-interlaced, ultra-high resolution, .28 dot pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt-and-swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 slots incl. 1 VESA Local Bus slot
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and MS Windows 3.1
- Other hard drive, video, memory, and monitor options available



\$2995 Hyundai 466D2

- 66MHz Intel 486DX2 w/8KB integrated cache
- 32-bit VESA Local Bus VGA graphics w/1MB VRAM
- 128KB "warpspeed" write-back 20ns SRAM L2 cache (expandable to 256KB)
- Processor upgradable via ZIF socket
- 8MB system memory expandable to 64MB on board
- 360MB 12ms IDE HDD, 256KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs
- 14" non-interlaced, ultra-high resolution, .28 dot

- pitch, 72Hz refresh rate, flicker-free, color display w/1024 x 768 resolution, tilt-and-swivel base
- 25/1P, integrated PS/2 mouse port
- 5 external drive bays, 2 internal
- 7 slots incl. 1 VESA Local Bus slot
- 200 watt power supply
- 101 keyboard, 2 button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and MS Windows 3.1
- Available in floor-standing model with ISA architecture as 466D2T, call for price
- Other hard drive, video, memory, and monitor options available

DO SOMETHING SMART. CALL HYUNDAI DIRECT SALES.

HYUNDAI
PCs designed and built in America

1-800-933-3445

PCMI16



166 Baypointe Pkwy, San Jose, CA 95134 Hours: 6AM-5PM PST M-F

We accept MasterCard, Visa, money orders, certified checks (allow 10 days for processing), CODs, approved company and institutional purchase orders, and wire transfers. All return items must be accompanied by a return merchandise authorization (RMA) number. Opened, defect-free software is non-refundable. Prices and product descriptions are subject to change without notice. Hyundai is not liable for damage due to omissions or typographical errors. All trademarks are the property of their respective companies. The Do Something logo is a trademark and Do Something New Breed is a registered trademark of Hyundai. © 1992 Hyundai Electronics America. All rights reserved.

DOO SOMETHING EXTRA

We'll give you more than you bargained for. When you go with the 486 stampede, from our 425SP to our powerhouse 466D2TE, we give you exclusive *low prices on software*. Our size and reputation allow us to forge alliances with all the major players in the industry, which means we can bring you software specials from firms like Microsoft, Borland, Lotus, and Symantec.

Do something safe.

The PC range war can shake everybody's confidence. Except ours. We're a \$50 billion global company, which means we have the resources to guarantee outstanding service and support. When you buy New Breed technology, you get New Breed service from a world-wide leader.

In addition to our service and support, we have a TQC (Total Quality Care) program that makes us the double-safe buy. Our 18-month warranty on all systems is a soft ride in the saddle.

The bottom line is your satisfaction. Buy the Hyundai 486 stampede, and you get more than New Breed technology. You get New Breed Service that leaves that old breed behind.



Great deals on optional software!

NEW BREED SERVICE AND SUPPORT



- One-year, next-business-day, on-site service with all direct orders, followed by 6-month, ship-in warranty on parts and labor.
- 30-day, no-risk, money-back guarantee on anything you buy direct from Hyundai.

- 48-hour turnaround on ship-in repairs.
- Beginners Help Line: 800-933-9917.
- Product spec fax: 800-723-4843.
- 7-days-a-week tech support:
 - 24-hour lifetime tech support: 800-289-4986.
 - 24-hour tech fax: 800-283-4986.
 - 24-hour tech bulletin board: 800-955-5432.
 - Tech support through CompuServe access.

24 HRS.
7 DAYS.

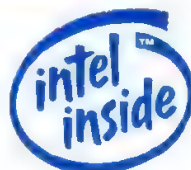
Hyundai 466D2TE New Breed Power Server

- 66MHz 486DX2 CPU w/8KB integrated cache
- 128KB high-speed L2 cache
- 32-bit EISA architecture
- 8MB RAM standard (expandable to 32MB on system board and 96MB via memory expansion board)
- 32-bit caching SCSI host adapter
- 360MB 12ms SCSI HDD, 256KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs
- SVGA graphics card
- 14" interlaced, ultra-high resolution, flicker-free, color display with 1024 x 768 resolution, .28 dot pitch, 72MHz refresh rate
- Seven 32-bit EISA slots, one ISA slot
- 5 external and 2 internal drive bays
- 300 watt power supply
- Built-in virus protection, front keylock, 2 level password
- 101 keyboard, 2 button mouse
- MS DOS 5.0 and Windows 3.1

\$3995

HYUNDAI
PCs designed and built in America

FOR DIRECT SALES **1-800-933-3445**





Hey, do something pronto! Fax your standard (or targeted) system configuration to one of our System Specialists.
We'll spec it out and call you back with a system quote that beats the cows. Or anyone else!

Fax your specs to 1-800-283-4986

Your Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone() _____ FAX() _____

Number of PCs in your current site _____ Brands you have standardized on _____

Other brands you are considering _____

Number of PCs installed 486 _____ 386 _____ 386SX _____ 286 _____

Tell us about your targeted system configuration

CPU Type ☐ 486 ☐ 486SX ☐ 386DX ☐ 386SX ☐ Notebook

Architecture ☐ ISA ☐ EISA

Memory _____ MB installed Cache Memory ☐ 128 KB ☐ 256KB

Floppies ☐ 1.44MB 3-1/2" ☐ 1.2MB 5-1/4"

Hard Disks (IDE) ☐ 100MB ☐ 120MB ☐ 200MB ☐ 250MB ☐ 330MB ☐ 500MB

(SCSI) 3.5" ☐ 360MB ☐ 540MB ☐ 1.2GB

5.25" ☐ 330MB ☐ 760MB ☐ 1.6GB ☐ 2.0GB

☐ Tape _____ MB ☐ Sound Card ☐ Other _____ ☐ Fax/Modem ☐ CD-ROM

Call for more options! Number of PCs you intend to order: _____

Other special needs: _____

Hyundai's recommendation and quote. Based on your input, here's what we recommend: _____

And here's our price: _____

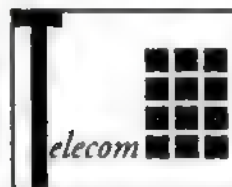
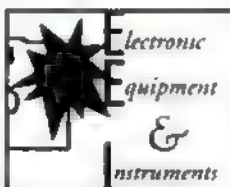
If we don't beat your other quotes, call us.

PCMI16

Call Hyundai Direct at 1-800-933-3445



For the dealer nearest you call 1-800-288-4986



U.S. Micro Express Inc.

Jet 486DX2-66

Although it's a solid system with enough of the right components, U.S. Micro Express's Jet 486DX2-66 lacks a distinguishing mark. For the most part, the \$3,450 entry offers average performance, although its memory and disk scores stood



The Micro Jet 486DX2-66

out on our benchmark tests.

Residing in a standard desktop case without sophisticated motherboard integration, the ISA-based Jet 486DX2-66 comes with a direct write-through 256K external static-RAM cache. This type of cache write policy prevented the system's processor scores from falling too low. But at the same time, it didn't allow the 66-

MHz Intel CPU to reach its full potential.

Like some of the other systems reviewed here, the Jet 486DX2-66 includes a fan and heat sink combination on the CPU to keep things cool. Unfortunately, this arrangement prevents the unit from accepting full-length cards in three of the eight expansion slots.

Occupying one slot is Orchid Technology's popular Fahrenheit 1280° graphical user interface accelerator card. Like many such adapters based on the 911 controller from S3, the Orchid did poorly on our DOS video test routines. But it performed above average in its accelerator class under Windows. The unit came to us with a 14-inch analog monitor made by Supercom. Although its power switch is in back, the brightness, contrast, and two horizontal/vertical controls are in front.

The Maxtor 320MB IDE hard disk, though not one of the top performers, garnered a satisfactory score on our DOS disk test routines and also took well

SUITABILITY TO TASK				
Jet 486DX2-66				
	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

to Windows.

U.S. Micro Express offers a warranty that covers one year on parts and two years on labor, along with extra-cost on-site service available only in the Pacific Northwest.—JQ

Wyse Technology

Wyse Decision 486si

This unit is not a Windows workstation. Priced at \$3,299 and housed in a compact, slimline chassis, the Wyse Decision 486si is aimed at corporate users who need a well-constructed 486 PC to handle day-to-day duties.

Inside, the memory banks and the ZIF (zero insertion force) socket are easily accessible. However, the Wyse Decision 486si uses a T-connector, and only two of the six available slots will accept full-length cards. The heat sink on the Intel 486DX2/66 CPU interferes with the bot-

FACT FILE

Wyse Decision 486si

Wyse Technology, 3471 N. First St., San Jose, CA 95134; 800-438-9973, 408-473-1200; fax, 408-473-1222

List price (tested configuration): \$3,299

Memory and processor RAM cache: 8MB 80-ns SIMMs, 256K cache

Disk drives and controller: Maxtor 15-ms 213MB IDE hard disk, National Semiconductor IDE controller, 1 2MB and 1 44MB Epson floppy disk drives.

Display: Hyper16 Video adapter with 1MB DRAM, Wyse 14-inch monitor with 72-Hz refresh rate at 800-by-600

Software: DOS 5.0, Microsoft Windows 3.1

In short: Wyse's entry offers corporate buyers a well-rounded package with plenty of amenities. Although the local-bus video won third place among our test group in DOS video performance, it came in slower under Windows. Processor performance was in the top half, but other scores were on the slow side

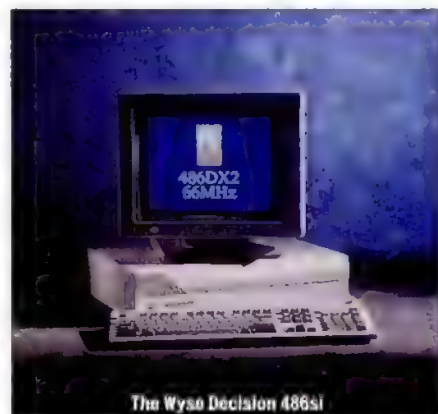


ON READER SERVICE CARD

tom slot.

Despite a high degree of integration and a well-rounded package, the Decision's strong suit isn't blazing performance. On our processor test routines, it landed midway among the reviewed systems. The unit's direct write-back 256K memory cache did not deliver every ounce of power from its 486DX2/66 and DOS memory scores ranked somewhat low. The Decision's disk scores were below par under DOS and unimpressive under Windows.

The proprietary local-bus video system, based on a Tseng ET4000 VGA con-



The Wyse Decision 486si

FACT FILE

Jet 486DX2-66

U.S. Micro Express Inc., 1930 116th Ave. NE, Bellevue, WA 98004; 800-874-5505, 206-462-7300; fax, 206-462-6303

List price (tested configuration): \$3,450

Memory and processor RAM cache: 8MB 70-ns SIMMs, 256K cache

Disk drives and controller: Maxtor 15-ms 336MB IDE hard disk, DFI IDE controller, 1 2MB and 1 44MB Chinon floppy disk drives

Display: Orchid Fahrenheit 1280° 1,024-by-768 adapter with 1MB of VRAM, Supercom 14-inch monitor with 60-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1

In short: Although the Jet was not one of the leaders on our benchmark tests, it earned decent marks in memory and disk performance



ON READER SERVICE CARD

troller, proved conducive to excellent DOS performance (it ranked third in this test group), but not even a local-bus design would be able to turn the Tseng-based controller into a top-notch Windows performer. Though the Decision logged a respectable Windows graphics score, most standard ISA accelerator

SUITABILITY TO TASK

Wyse Decision 486sl

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	●	○
Expandability	●	●	○	○

video adapters can outperform Wyse's local-bus implementation.

The total package includes a stand on which to place the unit alongside a desk, well-written documentation, a ZIF socket for easy CPU upgrades, and a pad-lock ring.

Wyse offers a one-year parts-and-labor warranty, and on-site service is \$99 for the first year.—JQ

Zenith Data Systems

ZDS Z-Station 466Xh Model 200

Although it lacks top-flight performance, the ZDS Z-Station 466Xh Model 200 still offers a high degree of integration, quality construction, and a raft of extra features. If you need a network-ready PC, ZDS's \$4,095 Z-Station is one unit to consider.

Scores on PC Labs' processor test routines were undoubtedly hurt by the Z-Station's lack of an external cache, which dragged it almost to the bottom of this test group. Memory performance was not

as hindered, remaining in the top third of the group, and the Western Digital 200MB IDE hard disk turned in reasonable disk scores under DOS and Windows. Thanks to its VESA local-bus arrangement, video performance was respectable under both DOS and Windows as well, though it was easily outdistanced by the fast-paced, current crop of graphical user interface accelerators.

In our test unit, ZDS installed a proprietary Adaptec SCSI adapter that can handle seven SCSI peripherals, an enhanced parallel port with high-speed data conduction, and an Ethernet adapter that carries an NE 2000 chip set but fits into a proprietary slot. The Z-Station's slim-line case restricts expansion somewhat but still leaves four full-length, 16-bit ISA expansion slots free.

Windows for Workgroups comes

FACT FILE

ZDS Z-Station 486Xh Model 200

Zenith Data Systems, 2150 E. Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331, 708-808-5000; fax, 800-472-7211

List price (tested configuration): \$4,095.

Memory and processor RAM cache: 8MB 80-ns SIMMs.

Disk drives and controller: Western Digital Caviar 2200 15-ms 200 IDE hard disk, IDE controller integrated on motherboard, 1.44MB Panasonic floppy disk drive.

Display: Western Digital/ATI adapter with 1MB VRAM, ZDS 14-inch FTM monitor with 60-Hz refresh rate at 1,024-by-768.

Software: DOS 5.0; Microsoft Windows 3.1; Windows for Workgroups; Banyan's VINES, Version 4.11; LAN Manager 2.1; Novell's NetWare 286, Version 2.2; Novell's NetWare 386, Version 3.11.

In short: Although far from being a top performer, this entry from ZDS contains many virtues for corporate customers.



preinstalled, and the unit's Flash BIOS is easily upgraded. The system is topped off by a 14-inch ZDS flat-screen monitor. All ZDS computers are network-ready out of the box. Our test unit came with Banyan's VINES, Version 4.11; Network Client software for LAN Manager 2.1; Novell's NetWare 286, Version 2.2; and

SUITABILITY TO TASK

ZDS Z-Station 486Xh Model 200

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	●	●	●	○
Windows applications	●	●	○	○
Expandability	●	●	○	○

Novell's NetWare 386, Version 3.11.

ZDS offers a one-year parts-and-labor warranty. On-site service will be available for a fee; however, the cost had not been determined at press time. Buyers should be able to find this unit offered at as much as 10 percent below list price.—JQ

Zeos International Ltd.

Zeos 486DX2-66

The Zeos 486DX2-66 is a Windows desktop machine that blew away our Windows graphics test routines (it doubled the score of its closest competitor and was nearly four-fold better than our previous best-ever score) and placed among the top 15 systems in Windows disk performance. Its \$2,995 price tag is competitive



The Zeos 486DX2-66

and includes an array of features to make a user's mouth water.

If you're one of those people who is afraid of sticking your hand inside a PC, the Zeos may be just the positive reinforcement that you need in order to become a technical guru. The motherboard is a Zeos original, with a Flash BIOS, a ZIF (zero-insertion-force) socket, and room for 64MB of memory. The Intel upgrade socket has extra pin holes in anticipation of Intel's next-generation processor. VLSI components and



The ZDS Z-Station 486Xh Model 200

FACT FILE

Zeos 486DX2-66

Zeos International Ltd., 530 5th Ave., N.W.,
St. Paul, MN 55112; 800-423-5891, 612-633-
4591; fax, 612-633-1325

List price (tested configuration): \$2,995

Memory and processor RAM cache: 8MB 70-ns
SIMMs, 128K cache

Disk drives and controller: Seagate ST3283A 12-
ms 245MB IDE hard disk with 128K buffer, adapter
integrated on motherboard, 1.2MB and 1.44MB floppy
disk drives

Display: Zeos VGA 9000 VESA local-bus adapter with
1MB RAM and Weitek chip set, CTX CVP-5468NI 14-
inch monitor with 70-Hz refresh rate at 1,024-by-768

Software: DOS 5.0, Microsoft Windows 3.1, choice
of two: Ami Pro 3.0, Freelance Graphics 1.0, and Lotus
1-2-3 for Windows 1.1

In short: Dazzling Windows performance, a wealth of
features, and a nice price make this Zeos worth
consideration

ON READER SERVICE CARD

intelligently placed wires make every-
thing accessible. Zeos offers an on-board
SCSI option for SCSI and SCSI-2 de-
vices. Eight ISA slots and seven drive
bays (four front-accessible and three in-

*If you're afraid of
sticking your hand inside
a PC, the Zeos may be just
the positive reinforcement
you need to become a
technical guru.*

ternal) are open for expansion.

Zeos's 128K processor RAM cache
turned in below-average DOS processor
scores and near-basement DOS memory
marks. Though the Seagate hard disk was
equally unimpressive, Zeos reports that
the IDE adapter will be on a local bus
by the time you read this, which should

SUITABILITY TO TASK

Zeos 486DX2-66

	POOR	FAIR	GOOD	EXCELLENT
DOS applications	☒	☒	☒	☐
Windows applications	☒	☒	☒	☒
Expandability	☒	☒	☒	☒

improve performance. But if you're a
Windows user, the Zeos VESA local-bus
design with its Weitek chip set will defi-
nitely meet your needs.

The CTX-built Zeos monitor is one of
the more disappointing features. Text
and graphics appear wavy at times and
are not pleasing to the eye. But overall,
the features of the Zeos 486DX2-66,
which include a choice of two out of three
Lotus applications (1-2-3 for Windows,
Ami Pro, and Freelance Graphics for
Windows), make this system worth a
look.

Zeos offers a one-year parts-and-la-
bor warranty, with on-site service avail-
able for the first year at a cost of
\$49.—BG □

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder,
CO 80322. Include your mailing label from a recent
issue of PC Magazine for faster service. Please allow
up to 60 days for change of address to take place.

With our print server you'll use less paper.

Money may not be everything. But it sure is a good reason for you to buy our Pocket Ethernet Print Server™. Not only is it faster than Intel, it's less expensive. It's also easier to work with. It plugs into the back of your printer with a minimum of effort. And it

can be easily connected anywhere on your network. In other words, you use less brainpower too. Give us a call at 1-800-874-7875 ext. 47A for the location of the MicroAge dealer nearest you. Because we would really hate to see you waste paper.

Xircom



NETWORK PRINTING

Sharing the Wealth

Your workgroup keeps its printers humming all day long, but print jobs are still backing up. You need more machines, but there's no way you'll get them under the current budget. And there are other dilemmas. Your company may have other printers that are used less frequently, especially at times when your department's needs are greatest. Linking the machines into the company network can expand your printing resources without incurring the cost of new printers. But with printers often halfway across the building, network printing is not always the most convenient solution.

For administrators facing problems with printing speed and printer accessibility, help is available. Remote print-server products let you conveniently locate printers anywhere on the network. And they remove the bottleneck of using a file server to process print jobs whenever it has some CPU cycles to spare.

To help you reap the benefits of networked printing, we evaluate 18 servers. Each of these products will connect a printer to a NetWare 3.11 LAN. There are a variety of product types, and each product differs from the others in price, performance, and functionality.

PSERVER VS. RPRINTER

The products in our roundup divide most basically into those that use NetWare's PSERVER utility and those servers that use NetWare's RPRINTER protocol. The approaches do have some similarities, however. In both cases, files are redirected from a user's PC to a special subdirectory, called a queue, on the file server.

But in the PSERVER approach, print servers use an application that emulates or works with the NetWare PSERVER utility to poll the print queue on the file server. Jobs destined for a particular printer



Cutting printing costs is easy, if you've got the right print server. Here are 18 servers that should be perfect for your LAN.

by Frank J. Derfler, Jr., and David Greenfield

are removed from the queue by the connected printer server and output to the printer.

Because they can communicate with the file server, PSERVER devices offer a high degree of control over the print queue. But on the downside, they require more processing power than RPRINTER devices do and are all identified by the NetWare management software as users. Most of the products in this review function only as PSERVERS.

Mosaic, the LANSprint, the HP JetDirect Card, and PrintQ LAN can work as PSERVER devices, or take the second approach to network printing: using NetWare's RPRINTER protocol to connect to the file server. With RPRINTER,

separate user. If you're reaching the limits of your user license, RPRINTER might be the appropriate approach.

THE RANGE OF CHOICES

Whether they use PSERVER or RPRINTER, these servers generally can be divided into software and hardware-based

an NLM (NetWare loadable module) directs jobs to printers attached to PCs on the network.

Because RPRINTER devices do not poll the queue, they lack the management features of the PSERVER devices, but in turn they don't require the intelligence of a PSERVER device. What's more, the network operating system doesn't count an RPRINTER device as a

products. Hardware print servers are either standalone, printer-based, or PC-based devices.

Mosaic, PS-Print, Printer Assist, LANSpool Software for NetWare, PrintQ LAN, and Network Assistant Plus VAP/NLM are software programs that run on a PC and use PSERVER to receive jobs from the file server. By running on a client PC, they allow you to offload processing from the file server. And, as with all print servers not based in the file server, you can attach the printers anywhere on the network. LANSpool and Network Assistant Plus can also run as NLMs on the file server.

If you can't afford to dedicate a PC as a print server, consider a hardware-based product. The Central Station, JetLAN/P, the LANpress, Pocket Printer Server, and NetPort II Print Server are all standalone units that connect to the printer, either directly or via cable.

Typically, these devices let you connect more than one printer to the network. In contrast, network printer cards slide into a printer and connect it to a network. The JetLAN, JetPress, ExtendNet 2856, and the HP JetDirect Card are net-

IN THIS REVIEW	
<i>Central Station</i>	252
<i>JetLAN</i>	255
<i>JetLAN/P</i>	255
<i>Mosaic</i>	257
<i>PS-Print</i>	265
<i>JetPress</i>	266
<i>LANpress</i>	266
<i>LANSprint</i>	266
<i>ExtendNet 2856</i>	268
<i>Pocket Printer Server</i>	268
<i>Printer Assist</i>	268
<i>HP JetDirect Card for Ethernet</i>	268
<i>LANSpool Software for NetWare</i>	269
<i>NetPort II Print Server</i>	269
<i>LANscript</i>	270
<i>PSERVER.NLM</i>	270
<i>PrintQ LAN</i>	272
<i>Network Assistant Plus VAP/NLM</i>	273

HIGHLIGHTS

Print Servers

EIGHTEEN PRINT-SERVER products for NetWare networks are reviewed here. They include hardware devices that connect to a network cable, network adapter cards that fit into a slot on a Hewlett-Packard LaserJet printer or a PC, software replacements and enhancements for NetWare print-server utilities, and combinations of the above.

PRINT SERVERS divide into several categories. Some print-server products consist only of software, others are hardware-based. Software-based print servers run either as NLMs in the file server or as applications in a PC. Hardware-based servers either slide into the printer or print server, or are external, standalone units that attach to the printer.

INCREASED FLEXIBILITY and per-

formance are the main reasons for installing a print server away from the file server. Remote print servers keep network printers and their output within easy reach of users while protecting the file server's security. And such a setup lets you offload work from the file server, freeing its processor to handle other tasks.

THE FASTEST PRINT SERVER we tested is LANQuest's LANscript, a combination of hardware and software. It outperformed the others in printing text and graphics files in PostScript modes, and finished near the top on the PCL (Printer Control Language) tests as well. The fastest software-only product was Software Directions' PrintQ LAN.

THE LEAST-EXPENSIVE print server reviewed here is Printer Assist, a \$249

software package from Fresh Technology (although Novell's own printer-server solution, PSERVER.NLM, does come bundled with NetWare). The lowest-costing print servers with hardware and software, at \$495, are the single-port version of Digital Products' LANSprint adapter card, and the Ethernet version of Extended Systems' self-contained Pocket Printer Server, an external device that connects to the network cable.

FUTURE ENHANCEMENTS to print servers will probably include features such as the one LANscript already has: its ability to switch between PCL5 and PostScript modes transparently depending on the type of print job you need. Digital Products' new NETSprint/200 will allow client PCs running different protocols to send output to the same printer.



EDITORS' CHOICE

work printer cards. Network printer cards are also available with many new printers from such vendors as Lexmark and QMS.

The last group are internal cards that slide into a computer. We reviewed two products that fit into this category, the LANSprint and LANscript. The LANscript package also includes a network printer card.

REVIEW CRITERIA

We looked for print servers that operate under NetWare 3.11, support Novell's Remote Printer Protocol (RPP), and offer 10BaseT connections.

We found a wide range of products that fit the bill and, in truth, even that wasn't the entire market. One company we originally overlooked, Rose Electronics, manufactures two lines of print servers. The MicroServe is an external device that connects a printer through a Centronics port to an Ethernet network. LanJet is an internal print server that slides into a LaserJet. Both products support PSERVER and RPRINTER. We had a chance to test the MicroServe late in our editorial cycle and found that it compares particularly well with the other external print servers on HP PCL text files, but not as well on graphics and PostScript files. Its automated install program makes setup particularly easy.

NETSprint/200, which Digital Products expected to bring to market by the time you read this, was unfortunately not ready in time for testing. This external hardware device allows client PCs to use different network protocols to access the same printer. The initial product line will support NetWare and AppleTalk, but in early 1993 NETSprint/200 will support any combination of three of the following protocols: AppleTalk, NetWare, TCP/IP, and VINES.

Lexmark is offering the IBM 4033 LAN Connection print server in three

- **JetLAN/P**
- **Mosaic**
- **PS-Print**
- **HP JetDirect Card for Ethernet**
- **LANscript**

Third-party print servers address the needs of network users and administrators for better performance, flexibility, and management than Novell's

PSERVER.NLM can offer. Our five Editors' Choices represent a wide range of product types.

For raw speed, LANscript, a hardware/software combination from LANQuest, demonstrated the best overall performance, especially in printing PostScript graphics. But it sells for a pricey \$2,495 to \$3,495.

Mosaic, marketed by Bitstream, is a winner because of its sophisticated printer management. Priced from \$695 to \$2,495, this software product is costly, but Mosaic provides accounting functions and automatic soft-font tracking—capabilities its competitors simply lack.

PS-Print, a software product from Brightwork Development, provides good general-purpose management features and NetWare integration, at

a cost of only \$395 per server.

Each of these three solutions requires a PC. You can avoid using a PC by installing the print server as a printer card inside your HP LaserJet. The fastest of these cards is the HP JetDirect Card for Ethernet, priced from \$695 to \$895.

An external device can reside near any printer with a parallel port. The JetLAN/P, \$595 from ASP Computer Products, was the easiest of the external devices to set up.

Earning honorable mention is PrintQ LAN, a software product from Software Directions. Priced from \$495 to \$2,995, it demonstrated excellent performance and usability. The program's main shortcoming is that it bypasses NetWare print management since it works with other networks.

models supporting NetWare, and three other models that support AIX, Microsoft LAN Manager, and OS/2. Emulex Corp.'s NETJet and Xircom's Pocket Ethernet Print Server were not available in time for testing.

BUYING CRITERIA

Selecting a print server begins with a consideration of its compatibility—with your network's protocol, cabling, and networking software. The product should also be able to handle the number of

printers you want to attach.

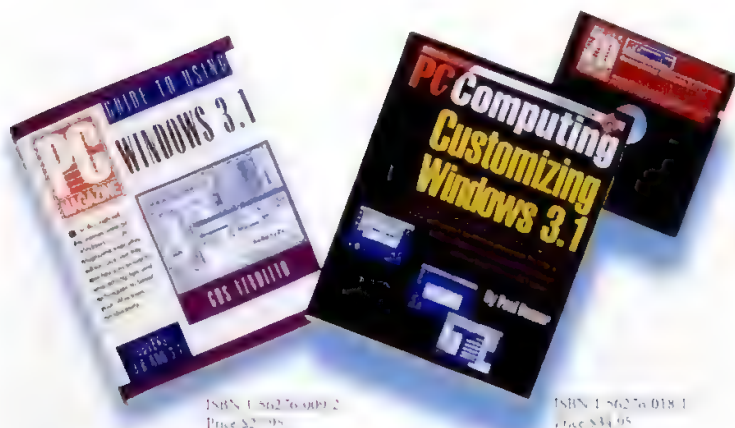
The hardware vendors whose products are reviewed typically offer different models for Token-Ring and Ethernet, and they have connection options for coaxial, shielded twisted-pair, and unshielded twisted-pair cable. Some devices can connect to as many as four printers, while others can address only one. This review focuses on NetWare, but some products, such as PrintQ LAN, can also work in other environments.

After you identify the products that meet your requirements for compatibility, you need to make some other important decisions, such as whether the product you pick should use an RPRINTER or a PSERVER connection.

After choosing the type of connection, consider whether you'll want a stand-alone print server or a software product. As a rule, hardware devices are small and

Our Contributors: FRANK J. DERFLER, JR., is senior networking editor of *PC Magazine*. DAVID GREENFIELD is associate editor of *PC Magazine*'s networking team. TONY POMPILI is systems manager at Ziff-Davis Publishing Co. ROBERT ANTHONY is editor of Stadium Circle Features. STEVEN C. M. CHEN is a Certified NetWare Engineer who runs CCM Consulting. GARY HAWKINS is Director of Systems Software Architecture for New York-based LANSystems Inc., a nationwide systems integrator. ROBIN T. SOTO is a mathematics lecturer and network supervisor at Hunter College's Department of Academic Skills.

Windows 3.1, Plus 2.



ISBN 1-56276-009-2
Price \$24.95

ISBN 1-56276-018-1
Price \$34.95

Microsoft Windows 3.1 plus two new books from *PC Magazine* and *PC/Computing* add up to smarter computing and new heights of productivity—whatever your skill level. The world-renowned experts at *PC Magazine* and *PC/Computing* share their insights in these two exciting books, both written fresh for Windows 3.1:

PC Magazine Guide to Using Windows 3.1: The ultimate how-to guidebook from *PC Magazine* contributing editor Gus Venditto. Scores of illustrations and hands-on examples will have you using all the supercharged Windows 3.1 features in record time.

PC/Computing Customizing Windows 3.1: Make Windows 3.1 work the way you do. *PC/Computing* senior editor Paul Bonner helps you customize existing Windows applications and write your own programs—even if you've never programmed before.

Available at fine bookstores, or call

1-800-688-0448

ext. 1319



© 1992 Ziff-Davis Press

efficient. Software products, however, are less expensive if you consider the PC as a sunk cost. The software print servers offer decent performance, but performance will degrade if you run the software on a nondedicated computer.

Analyzing the expense is a bit tricky. Be sure to examine the cost per printer connection. Some multiport hardware products are more expensive than single-port models, but justify the expense when they feed several printers. Don't forget the cost of a LAN adapter for the PC when you price software products.

THE MYTH OF THE PAPERLESS OFFICE

Predictions that paper would soon have no place in an emerging electronic office have proven groundless: Printing remains critical to workgroup productivity. Devices that let companies and departments share printing resources across a network enhance the value of these office workhorses.

Artisoft Inc.

Central Station

BY TONY POMPILI

Artisoft's Central Station offers print-server capability in a multipurpose hardware package. This flexible product supports up to three printers or other devices; it provides acceptable performance and moderately simple installation.

The \$595 Central Station was designed to connect portable PCs to LANs by working like a laptop docking station. It works in conjunction with NetWare Print Server Stationware, which comes bundled with the package. The product relies on NetWare's PCONSOLE for management, so it offers few frills there.

The hardware features unshielded twisted-pair Ethernet connections and two serial and two parallel ports. The Central Station redirects all of a PC's serial and parallel port I/O through its own ports, making it easy for mobile PC users to get on and off the network.

The Central Station's flexible connectivity capabilities allow it to function as a NetWare print server by acting as a PSERVER device. You configure Central Station by updating its flash ROM with NetWare Print Server Stationware.

The Central Station has its own power

OKIDATA USES 2,560 BURSTS OF LIGHT TO MAKE YOU LOOK BRILLIANT.



If you think all laser printers are mirror images of each other, meet the one that broke the mirror.

**OUR BRILLIANT LED PRINTER
LINE-UP INCLUDES THE
IMPROVED-RESOLUTION
OKIDATA OL810.**

Okidata® engineers flatly rejected the complex mechanism of rotating mirrors, focusing lenses and whirring motors that every major brand of laser printer depends on for its operation.

Instead, they designed a better way – a unique, solid-state LED printhead that precisely positions each one of 2,560 pinpoints of light, to produce a laser printer's brilliant output without a laser printer's built-in complications.



Since our solid-state LED printhead has no moving parts, Okidata guarantees it for five full years* – the industry's longest. (After all, our printers have a reputation of reliability to uphold.) And we offer a full range of machines that can handle any workload from basic word processing to sophisticated business text and graphics.

To see how Okidata page printers can help make your business look brilliant, call 1(800)OKIDATA for the name of the dealer nearest you. And look brilliant yourself.

WE DON'T JUST DESIGN IT TO WORK. WE DESIGN IT TO WORK WONDERS.®

Print samples created using popular software packages and printed on a range of Okidata LED Page Printers. *5 year limited warranty on LED printhead plus 1 year parts/labor on entire printer. OKIDATA and the OKI OK! are registered trademarks of Oki Electric Industry Co., Ltd. "We don't just design it to work. We design it to work wonders." is a registered trademark of Oki America, Inc.

CIRCLE 056 ON READER SERVICE CARD



► **S U M M A R Y O F F E A T U R E S**

Print Servers

In alphabetical order by company ■ = YES □ = NO	Artisoft Inc.	ASP Computer Products Inc.	ASP Computer Products Inc.	Bitstream Inc.	Brightwork Development Inc.	Castelle Inc.	
	Central Station	JetLAN	JetLAN/P	Mosaic	PS-Print	JetPress	
List price	\$595	\$595	\$595	\$695	\$395	\$595	
Type	External device	Network printer card	External device	Software	Software	Network printer card	
Hardware Interface							
Number of parallel ports	2	None	1	N/A	N/A	None	
Number of serial ports	2	None	None	N/A	N/A	None	
Buffer memory	128K	None	None	N/A	N/A	256K	
Type of network connector(s)	RJ-45	RJ-45	RJ-45	N/A	N/A	BNC, RJ-45	
Software Interface							
Menu/Command line	■ ■	■ ■	■ ■	■ □	■ □	□ □	
Lists queue size	□	□	□	□	□	□	
Lists number of jobs per queue	■	■	■	□	■	□	
Lists number of printers per queue	■	■	■	□	■	□	
Lists number of queues per printer	■	■	■	□	■	□	
Management Functions							
Number of queues monitored at once	1	1	1	15	1	1	
Offers on-board diagnostics	□	■	■	N/A	N/A	■	
Switches to different print server	■	■	■	□	■	□	
Switches to different queue	■	■	■	■	■	■	
Identifies printers connected to print server	■	■	■	■	■	■	
Management Information							
Name of print server being used	■	■	■	■	■	■	
ID of print server being used	■	■	■	■	■	■	
Operators of print server	■	■	■	■	■	■	
File being serviced	■	■	■	■	■	■	
Status of ports attached to print server	■	■	■	■	■	■	
Time needed to print the job	□	□	□	□	■	□	
File size/Number of pages	■ □	■ □	■ □	■ ■	■ □	■ □	
Names of the queues being used	■	■	■	■	■	■	
Printer names and types	□	□	□	■	■	■	
Priority of jobs	■	■	■	■	■	■	
User Functions							
Switches to different print server	■	■	■	■	■	■	
Switches to different queue	■	■	■	■	■	■	
Submits information by department	□	□	□	■	□	□	
Submits information by group	□	□	□	■	□	□	
Submits information by user	□	□	□	■	□	□	
Provides banner identifying user	■	■	■	■	■	■	
User Information							
Print server name/status	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	
Number of attached printers	□	□	□	■	■	■	
File being serviced	■	■	■	■	■	■	
Available printers	□	□	□	■	■	■	
Change in paper type required	□	□	□	■	■	■	
Manual feed required	□	□	□	■	■	□	
Time needed to print the job	□	□	□	□	□	□	
Job complete	■	■	■	■	■	■	

N/A—Not applicable: This is a software product

NETWORKING

Print Servers

Castelle Inc. LANpress	Digital Products Inc. LANSprint	Extended Systems Inc. ExtendNet 2856
\$895	\$695	\$695
External device	Internal PC card	Network printer card

2	2	None
2	None	None
256K	None	64K
AUI, RJ-45	None	RJ-45

☐	☒	☒
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

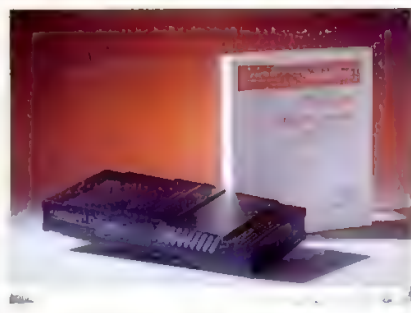
1	1	1
☒	☒	☒
☐	☐	☐
☒	☒	☒
☒	☐	☒

☒	☒	☒
☒	☐	☒
☒	☒	☒
☒	☒	☒
☒	☐	☒
☐	☐	☐
☒	☐	☐
☒	☐	☒
☒	☒	☒
☒	☐	☒

☒	☐	☒
☒	☐	☒
☐	☐	☐
☐	☐	☐
☐	☐	☐
☒	☐	☒

☒	☐	☒
☒	☒	☒
☒	☐	☒
☒	☒	☒
☒	☐	☒
☐	☐	☐
☐	☐	☐
☒	☒	☒

CONTINUES



FACT FILE

Central Station

Artisoft Inc., 691 East River Rd., Tucson, AZ
85704; 800-846-9726, 602-293-4000

List price: \$595.

Requires: NetWare 2.2 or higher.

In short: The Central Station was originally designed by Artisoft as a versatile docking station to give laptops a wide variety of network connections; the product can also be set up as a print server when used in conjunction with NetWare Print Server Stationware, which comes bundled in the package. But Artisoft's manual doesn't clearly explain how to perform the setup, and the print server's performance is slow in comparison with other products in our roundup.



supply and power switch, but that means it can be turned off or unplugged without the knowledge of the system administrator. Artisoft's software does not give any indication of the device's status, and PSERVER does not provide this information. In case the power goes off accidentally, the Central Station can resume a print job after power returns, at the point at which it left off.

Although a little more cumbersome and a lot slower than competing solutions, the Central Station's flexible architecture and complete integration with NetWare make it a good solution for users with a wide range of needs.

ASP Computer Products Inc.

JetLAN

JetLAN/P

BY TONY POMPILI

ASP Computer Products' JetLAN and JetLAN/P are easy-to-install, secure NetWare print servers in internal and external versions. Each product can be in-

stalled in a matter of minutes, and each costs \$595. The internal version, the JetLAN, needs better compatibility with Hewlett-Packard's PostScript Cartridge Plus to be as flexible as some of its competitors, however.

The JetLAN fits into the I/O slot of an HP LaserJet Series II or III printer. The JetLAN/P, an external dedicated device, connects to the printer's parallel port via cable.

Both products connect the printer directly to the network and give instant feedback on network status through four LEDs. The LEDs indicate connection to the server and hub and whether the server is transmitting or receiving network data.

Both JetLANs include diagnostic utilities that give more information about the print servers and printers on the network than many other print servers do. The utilities use a standard Novell interface that enables them to search the network for JetLANs and list those products, together with other device names, models, printer on-line status, and other information. For quick troubleshooting,



FACT FILE

JetLAN

JetLAN/P

ASP Computer Products Inc.,
160 San Gabriel Dr., Sunnyvale,
CA 94086; 800-445-6190, 408-746-2965;
fax, 408-746-2803

List price: \$595 each.

Requires: NetWare 2.15 or later. JetLAN: LaserJet II, IID, III, or IIID. JetLAN/P: printers with parallel ports.

In short: The JetLAN fits into a printer's I/O slot, and the JetLAN/P connects to a network cable. They work adequately, but there is a compatibility problem between the JetLAN and HP's PostScript Cartridge Plus.



NETWORKING

Print Servers

► SUMMARY OF FEATURES

In alphabetical order by company							
■ = YES □ = NO							
	Extended Systems Inc. Pocket Print Server	Fresh Technology Co. Printer Assist	Hewlett-Packard Co. HP JetDirect Card for Ethernet	Intel Corp. LANSpool Software for NetWare	Intel Corp. NetPort II Print Server	LANQuest Labs LANscript	
List price	\$495	\$249	\$695	\$599	\$699	\$2,495	
Type	External device	Software	Network printer card	Software	External device	Internal PC card	
Hardware Interface							
Number of parallel ports	1	N/A	None	N/A	2	None	
Number of serial ports	None	N/A	None	N/A	1	None	
Buffer memory	32K	N/A	64K	N/A	64K	8MB	
Type of network connector(s)	RJ-45	N/A	RJ-45	N/A	None	None	
Software Interface							
Menu/Command line	■ ■	■ □	□ ■	■ ■	■ ■	■ □	
Lists queue size	□	■	□	■	□	□	
Lists number of jobs per queue	■	■	■	■	■	□	
Lists number of printers per queue	■	■	■	■	■	□	
Lists number of queues per printer	■	■	■	■	■	□	
Management Functions							
Number of queues monitored at once	1	1	1	3	3	1	
Offers on-board diagnostics	□	N/A	■	N/A	■	■	
Switches to different print server	□	■	■	■	■	■	
Switches to different queue	■	■	■	■	■	■	
Identifies printers connected to print server	■	■	■	■	□	■	
Management Information							
Name of print server being used	■	■	■	■	■	■	
ID of print server being used	■	■	□	■	■	■	
Operators of print server	■	■	□	■	■	■	
File being serviced	■	■	□	■	■	■	
Status of ports attached to print server	■	■	■	■	□	□	
Time needed to print the job	□	■	□	■	□	□	
File size/Number of pages	■ □	■ □	■ □	■ □	■ □	■ □	
Names of the queues being used	■	■	■	■	■	■	
Printer names and types	■	■	■	■	■	■	
Priority of jobs	■	■	■	■	■	■	
User Functions							
Switches to different print server	■	■	□	■	■	■	
Switches to different queue	■	■	□	■	■	■	
Submits information by department	□	■	□	■	□	□	
Submits information by group	□	□	□	□	□	□	
Submits information by user	□	□	□	□	□	□	
Provides banner identifying user	■	■	□	■	■	■	
User Information							
Print server name/status	■ ■	■ ■	□ ■	■ ■	■ ■	■ ■	
Number of attached printers	■	■	□	■	■	□	
File being serviced	■	■	□	■	■	■	
Available printers	■	■	□	■	■	□	
Change in paper type required	■	■	□	■	■	□	
Manual feed required	□	□	□	■	□	□	
Time needed to print the job	□	□	□	□	□	□	
Job complete	■	■	□	■	■	■	

N/A—Not applicable This is a software product

NETWORKING

Print Servers

Novell Inc. PSERVER.NLM	Software Directions Inc. PrintQ LAN	Third Planet Software Inc. Network Assistant Plus VAP/NLM
Included with NetWare 3.11	\$495	\$435
Software	Software	Software

N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

■ ■	■ □	■ ■
□	□	□
■	■	■
■	■	□
■	■	□

1	1	1
N/A	N/A	N/A
■	■	■
■	■	■
■	■	■

■	□	■
■	□	□
■	□	□
■	■	□
■	■	■
□	■	□
■ □	■ □	■ □
■	■	■
■	■	■
■	■	■

■	□	□
■	■	■
□	□	□
□	□	□
□	□	□
■	■	■

■ ■	□ ■	□ □
■	■	□
■	■	■
■	■	■
■	■	■
□	□	□
□	■	■
■	■	■

ENDS

you can use the utilities to print a test file.

Problems cropped up when we tried setting up the JetLAN with HP's new PostScript Cartridge Plus: The printer status line indicated a conflict. Although ASP attempted to provide us with some workarounds, we were unable to test the product in PostScript mode. ASP said it would work with Hewlett-Packard to resolve the conflict and provide free upgrades to customers.

ASP uses PCONSOLE to attach JetLAN servers to print queues. JetLAN can support as many as 40 queues and 15 servers, making it useful for networks with multiple servers.

ASP's clear, well-illustrated documentation does a good job of explaining the product and installation. Both JetLANs are great solutions for any LAN where the administrator can't keep a watchful eye on print stations, and where reliable printing services are a must.

Bitstream Inc.

Mosaic, Version 1.0

BY ROBIN T. SOTO

If you need total control of print jobs and don't mind spending time installing the print server, Mosaic is for you. Formerly marketed by Insight Development Corp., Mosaic is a software-based print server that can support as many as 20 printers and 15 NetWare print queues. The number of print jobs it supports is limited only by NetWare. Pricing starts at \$695.

One of the distinctive features of Mosaic is its ability to optimize printer resources for each job. Mosaic can manage printer groups (called hunt groups) so that printer resources are automatically optimized or restricted according to print-job requirements. By keeping track of user preferences and default queue fonts, for example, Mosaic can collect personalized groups of fonts. This gives the program an organized way of downloading fonts to particular printers for certain print jobs, thus conserving printer memory. The program provides powerful administrative features. You can configure queues in a number of ways, including by printer type, fonts, and forms. You can monitor real-time information about print jobs from any client station. Users can be associated into groups, depart-



FACT FILE

Mosaic, Version 1.0

Bitstream Inc., 215 First St., Cambridge, MA
02142; 800-522-3668, 617-497-6222;
fax, 617-868-0784



List price: 50 workstations and 5 printers, \$695; 100 workstations and 10 printers, \$1,295; 250 workstations and 20 printers, \$2,495

Requires: 585K RAM, 20MB on server; NetWare 2.15 or later.

In short: Bitstream's Mosaic, a software-only product, is best suited for organizations that have complex printing needs. The product offers plenty of statistics, the ability to match a print job to the best-sorted printer on the network, and the ability to download and upload soft-font collections in order to preserve printer memory. The current version of the product is difficult to configure and has a lengthy installation procedure, however.



ments, or projects. This helps network managers define user rights and generate audit reports on printer usage.

Mosaic's basic package includes accounting and statistical reporting. Administrators can audit accounting statistics, such as paper used and the number of copies made, by user, group, or other criteria.

The Mosaic manager program allows users and supervisors to control network printers from any client station. Every user can maintain personal soft-font collections and check the status of print jobs. Administrators can also delegate to users full or partial rights to the management main menu.

Installation is complex, and it doesn't help that long descriptions of menu items bog down the instructions in the manual. The company needs to provide more concise, step-by-step instructions before discussing menu items. Bitstream is currently developing an automated install program. In the meantime, be prepared to spend a little time telephoning the company's tech support crew.

Mosaic is one of the most powerful print servers we've reviewed. If you can weather its quirky installation, Mosaic's strong print administration makes it an enticing choice.

► BENCHMARK TESTS

Print Servers

Novell's PSERVER.NLM, which comes included with NetWare 3.11, is just fine for printing text files. Printing PostScript graphics files, however, requires the kind of speed boost that LANQuest's LANscript offers. If you need to print PCL graphics files, you'll want to check out Software Directions' PrintQLAN.

WHAT THE NUMBERS MEAN

Gauging print-server performance requires weighing print speed against the amount of network overhead each product requires. The more often the print server polls the print queue for jobs, the higher the performance level—and the higher the network overhead as well.

Software Our tests of software servers yielded several notable results. The speed of Fresh Technology's Printer Assist was adversely affected by its long polling interval (every 20 seconds). The product's scores were below the overall and group average on each test.

Intel and Third Planet Software claim that their respective products, LANSpool Software for NetWare and Network Assistant Plus VAP/NLM, are more efficient than PSERVER because they write directly to IPX, whereas PSERVER writes to SPX. Both were indeed significantly faster than PSERVER with PostScript graphics files. We suspect that the three products performed more similarly on PostScript text files because text files are less likely to stress the printer interface and parallel port.

When printing to a PCL printer, neither product outperformed PSERVER. That may in part be because PCL is not as traffic-intensive as PostScript. With PCL, not every packet needs to contain font information, so PCL can send a job across the network in fewer packets than PostScript can.

In fact, PSERVER was faster than Network Assistant Plus on both PCL tests. On the HP PCL Graphics File test, PSERVER was nearly twice as fast as Network Assistant Plus. We found that when you print a job under

Network Assistant Plus, the file is sent first to the print server, then to the file server. Once the job is queued in the file server, it is sent back to the print server. This roundabout procedure is only aggravated by Network Assistant Plus's inability to chain packets together. The software must wait for an acknowledgment that the file is transferred correctly before sending another packet.

By contrast, PrintQLAN offered the best test scores of any of our tested products on both of the HP PCL tests. The key to its performance is that it does not require Novell's Capture utility to move data across the network, bypassing Novell's print utilities by creating a direct connection between the user's PC and the print server.

External Devices The external print servers performed at about the same level, including the Central Station, which is not optimized for print-server operation.

The Pocket Printer Server's superior performance on the HP PCL Text File test can be attributed to its 5-second polling interval.

The JetLAN/P and NetPort II Print Server delivered better performance on the graphics tests than the other external devices, partly because of their frequent polling. The JetLAN/P also optimizes its performance by minimizing the traffic that needs to be passed across the network. Normally, job-specific information, like font types, must be passed across the network with each block of data. The JetLAN/P requires only the first block of data to carry the job-specific information.

Network Printer Cards The HP Jet-Direct Card for Ethernet was the fast-

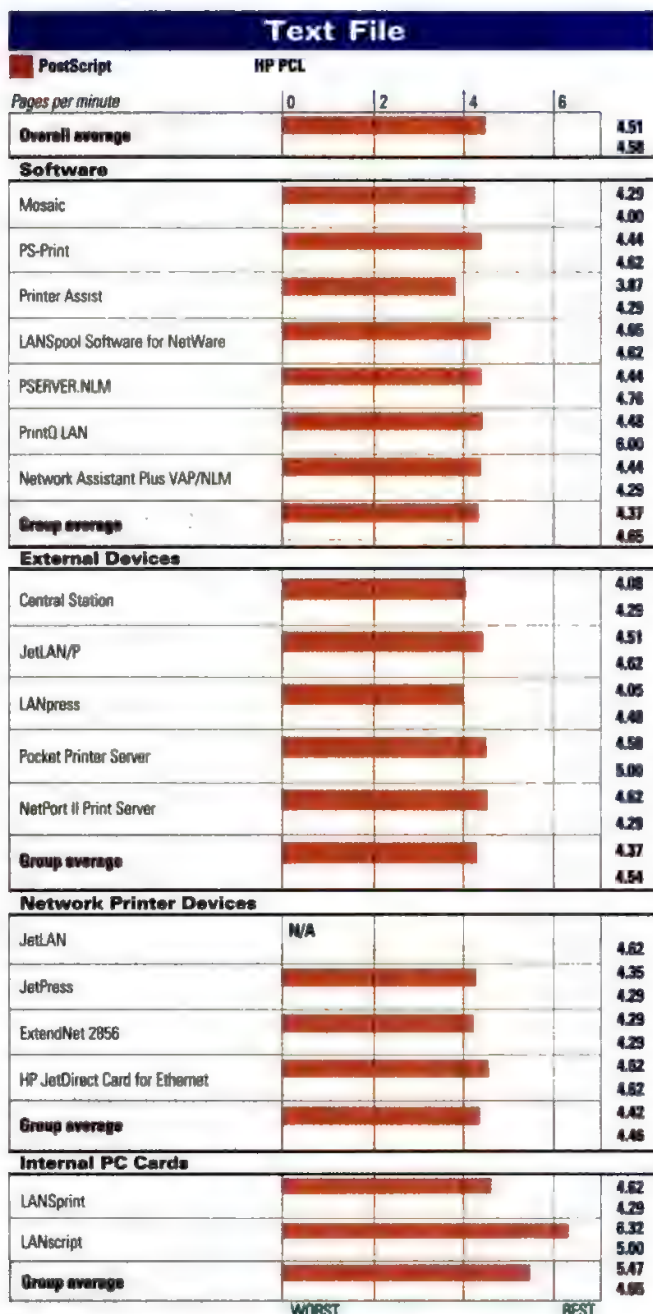
est of these cards. The product took first place outright on two of our tests and tied for first on the other two. The JetLAN does not support the HP PostScript Cartridge Plus and thus could not perform the PostScript versions of our tests. It tied for first place on the HP PCL Text File test.

Internal PC Cards If you want an internal PC card, LANQuest's LANscript is a great choice. Among all the varieties of print servers we tested, it was by far the fastest in printing PostScript files. And it was bested by only one product, PrintQLAN, on the HP PCL Text and Graphics File tests. The LANscript achieves its performance by processing jobs on an Intel I960CA chip on its PC add-in card, rather than using the less powerful Motorola 68000 on the HP LaserJet III. The LANscript also speeds up the connection between the printer and the print server by replacing the PC's parallel port with its own high-speed interface card.

Digital Products' LANSprint replaces the PC's parallel port with what the vendor calls a high-speed connection. While we did see good performance on several tests, we saw no evidence of the company's claimed tenfold speed increase. The company maintains that its product is optimized for printers with higher speeds than our test-bed unit, such as the HP LaserJet IIISi. We retested the LANSprint with a IIISi but failed to see any significant difference in the test results.

The performance differences as expressed in pages per minute may appear slight, but over the course of several hours' printing on a heavily trafficked network, these differences can become considerably more pronounced.





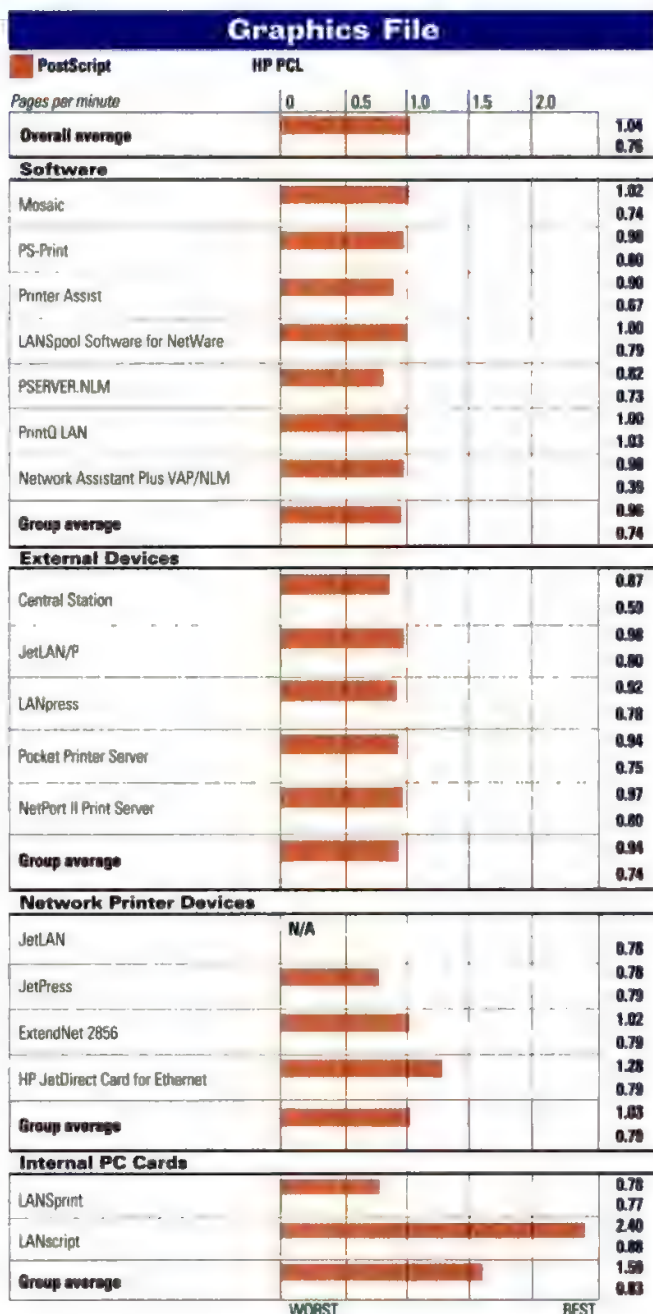
N/A—Not applicable: This product does not support HP's PostScript Cartridge

HOW WE TESTED

Our test-bed consisted of three Compaq Deskpro 386/25e's, each with 4MB of RAM, a 100MB hard disk, and Eagle's NE2000 Ethernet LAN adapter. One Compaq acted as a file server running NetWare 3.11; the second acted as a user's station, sending print jobs across the network to the print servers reviewed here. We used the third computer for products that had to be installed in a dedicated PC.

We tested most of the products we reviewed using PSERVER. We configured the JetDirect Card and LANsprint as RPRINTER devices, while the JetPress, LANpress, ExtendNet 2856, and Pocket Print Server used their own software programs that acted as PSERVER replacements.

Our printer was an HP LaserJet III with 2MB of RAM. For each of the external



devices we reviewed, we connected the printer directly to the product's parallel port; for other types of products, we connected the printer to the network. We ran two versions of each test, with the LaserJet configured first in PostScript mode, using the HP PostScript Cartridge Plus, and then in HP PCL mode. For the **Text File** test, we measure how long each product takes to print a 48K, 10-page text file (created in Microsoft Word) using an HP LaserJet III printer. We time the test with a stopwatch, starting when we click on the application's OK button to send the file to the print server; the timing stops when the last page exits the printer. We print the file three times and average the results. The **Graphics File** test uses the same procedure as the Text File test for a 900K graphics file consisting of six slides generated in Microsoft PowerPoint.

Screamers un

IDC Weekly Update

You've never seen Windows™ go this fast for a price this low. The new DECpc 486 PCs, with local-bus video and GUI acceleration, are blasting past the competition in Windows performance. How did we do it? We built them ourselves, with a rugged design and high-end features you won't find on other systems priced this low.

"Digital's system was the overall winner in PC Week Lab's tests. Its video subsystem beat out all the others."
PC Week, Oct. 5, 1992

"Digital's implementation of local-bus video yields outstanding results on our Graphics WinMark benchmark test."

PC Magazine, Nov. 24, 1992

PC Magazine WinMark Test

	Graphics WinMark (megapixels per second)
DECpc 450d2 LP (486DX2/50)	12.98
50-MHz 486DX2 average	5.51
Dell System 486D/50 (486DX2/50)	1.58

Higher scores represent better performance.
Source: PC Magazine Labs, PC Magazine, Nov. 24, 1992

"Credible prices and service competition to new 'value-priced' computers from Compaq, Dell, and IBM."
PC Magazine, Nov. 24, 1992

Put a DECpc's remarkable Windows speed to work for you. Call 1-800-PC BY DEC (1-800-722-9332) today to order one. Or fax us your name and address and we'll send you the full story. It's the next best thing to testing it yourself.

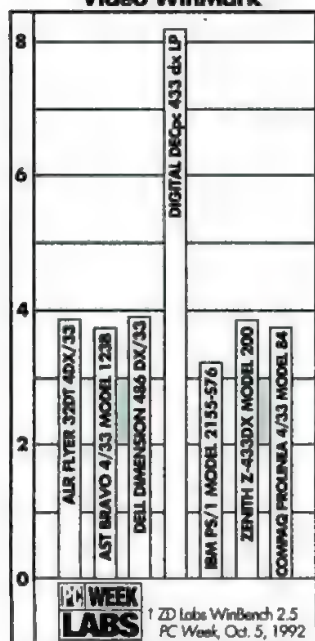
1-800-PC BY DEC

(Reference AYQ when you call.)

"I think they're a winner."
Andy Seybold, Associated Press, Aug. 24, 1992

digital™

Video WinMark¹



DECpc LP 486 PCs

- DECpc 425sx LP
- DECpc 433dx LP
- DECpc 450d2 LP
- DECpc 466d2 LP
- Upgradable design
- Local-bus video
- GUI accelerator
- Vacancy Socket
- 128 KB writeback cache
- 3 full-height ISA slots
- 4 drive bays
- MS-DOS® 5.0 and Microsoft Windows 3.1™ installed¹
- NetWare™ and PATHWORKS™ certified
- Up to 72 Hz refresh rate



DECpc 425sx LP i486SX 25 MHz System

- 4 MB RAM
- 122 MB Hard Drive
- VGA Color Monitor* (14", 0.29 mm)
- 3.5" 1.44 MB Floppy Drive
- Keyboard and Mouse
- MS-DOS 5.0 & Windows 3.1
- Fully Upgradable
- Free Shipping



DECpc 450d2 LP i486DX2 50 MHz System

- 4 MB RAM
- 122 MB Hard Drive
- VGA Color Monitor* (14", 0.29 mm)
- 3.5" 1.44 MB Floppy Drive
- Keyboard and Mouse
- MS-DOS 5.0 & Windows 3.1
- Fully Upgradable
- Free Shipping

*Monitor may differ from that shown. © Digital Equipment Corporation, 1993. Digital believes that the information in this advertisement is accurate as of its publication date; such information is subject to change without notice. Digital is not responsible for any errors. The following are trademarks of Digital Equipment Corporation: DECpc, Digital, the DIGITAL Logo, and PATHWORKS. The Intel Inside Logo is a trademark of Intel Corporation. All other trademarked names that are referenced in this advertisement, but are not included in the above listing, are the trademarks or registered trademarks of their respective owners.

der Windows, :



Solving Network Printing Problems *by Gary Hawkins*

Your print server can run into problems of many kinds, with varying frequency. We've rated their severity on a scale of 1 to 5, with 5 being the most severe.

Problem	Severity	Frequency	Solution
The printer will not print.	5	Frequent	Make sure the printer is on-line, with its cable connected. Check for correct serial- or parallel-mode settings. Run diagnostics to look for interrupt conflicts. Check the communications settings of serial printers.
The printer will not print when the print-server software is loaded.	5	Frequent	Make sure the print server's software setup reflects the PC's hardware. Run diagnostics to look for interrupt, TSR, and memory-management conflicts. Check the communications settings of serial printers.
The printer will print only garbage characters.	5	Frequent	Make sure your apps use the correct print driver and the user log-on script indicates the correct printer. Check NetWare's PRINTCON for formatting conflicts with your application.
The Capture utility will not read the print job data.	3	Infrequent	Use SYSCON to check whether you have trustee rights to the directory where PRINTCON.DAT is located.
DOS reports that the printer is not ready when Capture is running.	2	Frequent	Load a later version of the network shell.
Some pages of the print job are missing.	5	Frequent	Increase the Timeout parameter by typing CAPTURE TI=30.
The printer will print only the first page of the job.	5	Infrequent	Check the printer's handshaking setting and the wiring on the pinouts of any custom serial cables.
Graphics are printed across two pages.	4	Infrequent	Add more memory to the printer.
A second printer outputs a portion of the print job.	2	Infrequent	Disable print spooling in applications and avoid switching printers before print jobs finish.
The print server loses its connection to the network.	3	Infrequent	Add these lines to the NET.CFG or SHELL.CFG file: SPX ABORT TIMEOUT = 4000 SPX LISTEN TIMEOUT = 2500
The print server will work under DOS but not under Microsoft Windows.	5	Infrequent	Add SET TEMP to the AUTOEXEC.BAT file. Increase the free disk space. Make sure you have the correct printer driver. Add NetHeapSize=58 to SYSTEM.INI. Get the latest VNETWARE.386 from Novell. Disable the Print Manager. Set Capture parameters to Byte Stream No Form Feed Disable Timeout No AutoEndCap.
DOS programs will not print correctly under Windows.	3	Frequent	Modify the Capture parameters by increasing the Timeout to 30 or 60 (TI=30, TI=60) and disabling tabs (NT).
The Windows Print option is grayed out and cannot be chosen.	5	Infrequent	Make sure a printer is installed and a default printer selected under Windows' Control Panel.
Windows applications will not print.	3	Frequent	Select a permanent network print queue in the Control Panel. Use the Attach option for remote servers.
Control characters appear in Microsoft Windows printouts.	3	Infrequent	Increase the Transmission Retry parameter in Windows' Control Panel.
Microsoft Windows applications print very slowly.	3	Frequent	Disable Windows' Print Manager and reconfigure your printers to print in parallel mode.
Non-Windows applications print very slowly.	2	Frequent	Make sure you are using the right printer driver. If you're using PostScript, be patient.
The printer will not print out a particular job.	2	Frequent	Check PCONSOLE to see whether the job is in the queue. If it is, the printer may be off-line or may need paper.
The printer does not always print jobs from the same application reliably.	3	Infrequent	Delete and recreate print queues to eliminate corrupted queues. Enter the new queue IDs in the print-server software.
PCONSOLE indicates that the print queue will not release a job.	3	Frequent	Make sure you have the correct drivers, especially for PostScript printers.
A "40 Error" message appears on the LaserJet control panel.	3	Infrequent	Check serial printers' communications settings and your print-server software's serial driver.
The LaserJet feeds part of a page, or only one page, before jamming.	3	Frequent	Verify that the page size you have specified in the application matches what is in the paper tray.
Printing continues after the job has been deleted from the queue.	1	Infrequent	Turn the printer off and on again to clear the printer buffer.
A "Printer not selected" message appears in response to a print request in WordPerfect.	2	Infrequent	If WordPerfect's selection list has no entries, use the Additional Printers option. Recreate WP's setup file if it has been deleted or corrupted.

Brightwork Development Inc.

PS-Print, Version 3.4

BY TONY POMPILI

Version 3.4 of Brightwork Development's PS-Print software adds superb print-queue management to NetWare. This software-based print server is a good buy at \$395 per server. Emulating Novell's PSERVER, PS-Print monitors NetWare print queues and sends output to as many as five printers attached through serial or parallel connections to the PC on which PS-Print is installed. PS-Print uses only 9K of the print server's RAM. It also provides a TSR called QueueIt! that users can pop up from within DOS applications to redirect files to various queues.

Queue management puts PS-Print

head and shoulders above Novell's PCONSOLE. PS-Print's console program, PSP-CON, runs on the server and reports on the status of the printer and queue. PS-Print also does a nice job of sensing form changes, warning users to insert legal-size paper, for example.

Although PSP-CON always identifies paper-out and jam problems as simply "off-line," it provides detailed, extremely

helpful information about the filename and source, the file size, and the amount of bytes left to print. PS-CON's intuitive interface lets you delete, prioritize, and pause files.

The product did freeze the PC when running as a nondedicated server under Windows 3.1. Bright-

work advises users to run PS-Print as a minimized DOS application in Windows Program Manager. Unfortunately, the print server will go down if you

exit Windows or close the icon.

Brightwork's documentation is easy to follow, but troubleshooting information is a bit weak. An ideal fit for medium-size LANS and sub-LANS where LAN managers are not always on hand,

*PS-Print is an ideal fit
for medium-size LANS
and sub-LANS where
administrators are not
always on hand.*

PC EDITORS CHOICE	FACT FILE
	PS-Print, Version 3.4 Brightwork Development Inc., 766 Shrewsbury Ave., Jerral Center West, Tinton Falls, NJ 07724; 800-552-9876, 908-530-0440; fax, 908-530-0622
	List price: \$395 per server. Requires: 5K RAM on client PC, NetWare 2.1 or later In short: PS-Print, a software-only product, provides superb print-queue management. For users who are familiar with the NetWare printing architecture, it represents an easy-to-use enhancement. The product has some problems working with Windows 3.1 as a nondedicated server.
	 551 ON READER SERVICE CARD

GREAT THINGS COME IN SMALL PACKAGES

*This powerful print server
can tackle your biggest
network printing problems*

- Connects any parallel printer directly to your Ethernet LAN
- Fully Novell Network 286 and 386 compatible
- Can attach to 8 file servers simultaneously
- Fast and easy to install
- Combines high-speed printing and exceptional printer control
- Supports encrypted passwords, forms, notify, cancel, and others
- Full one-year warranty and unlimited free technical support
- Made in the U.S.A.



Make the Rose Connection

10850 Wilcrest Drive • Houston, Texas 77099 • Phone (713) 933-7673 • Fax (713) 933-0044

CIRCLE 290 ON READER SERVICE CARD

 **ROSE
ELECTRONICS**

1-800-333-9343

NETWORKING

Print Servers

PS-Print 3.4 brings greater control over print queues to NetWare and delivers the feedback users need to print on a LAN.

Castelle Inc.

JetPress LANpress

BY STEVEN C.M. CHEN

Need a way to move your file server to a more secure location while keeping network printers accessible? Castelle's \$895 LANpress offers an ideal multiport print-server solution. On the other hand, its JetPress, priced at \$595, only allows one LaserJet hookup to the network.

The JetPress, an internal card for the printer, uses the optional I/O slot on an HP LaserJet Series II, IID, III, or IIID. The performance of the two products is slightly below that of the other hardware-based print servers on most of our tests.

*Castelle's LANpress is a
clear choice for users
who need a print server
with multiple printer
connections.*

Both products act as PSERVER devices and use encrypted passwords for greater network security. A new version of the LANpress adds a high-speed LPT2 printer port. Status reports are available only on LPT1 and COM1.

To install the JetPress or LANpress, you can use Castelle's own programs, standard Novell PCONSOLE, or command-line statements. You must use Castelle's install program to configure the printer for PCL or PostScript modes. Unfortunately, you have to configure file servers one at a time for every Castelle print server you attach. On a large network with multiple servers, making a small change to a LANpress can end up taking an entire afternoon.

And there are other inconveniences. The last time we reviewed the LANpress

(in "Building Workgroup Solutions: Special-Function Servers," January 15, 1991), it lacked an on/off switch. It still does, so you must still unplug the oversize AC adapter whenever you change the configuration. Although the oversize adapter makes the system less susceptible to being turned off accidentally, a remote reset function, such as the one that comes with Extended Systems' ExtendNet, would be a nice addition. Moreover, neither Castelle product supports form reject, mark top of form, or rewind print job under PCONSOLE's Print Server Status/Control options.

The LANpress is a clear winner for users who need a print server offering multiple printer connections. And the JetPress's encryption features may give it the edge over other internal cards for an HP LaserJet's optional interface slot.

Digital Products Inc.

LANsprint

BY ROBIN T. SOTO

One of the few print servers that is an internal PC card, LANsprint can function as a dedicated or nondedicated server. Two versions of the PC board are available: a single-port version for \$495



FACT FILE

LANsprint

Digital Products Inc., 411 Waverley Oaks Rd., Waltham, MA 02154; 800-243-2333; 617-647-1234; fax, 617-647-4474

List price: Single-port version, \$495; dual-port, \$695.

Requires: 256K of RAM on file server for supporting up to 16 printers, 18K of RAM on client PC, 998K of disk space on file server, NetWare 2.15 or later.

In short: The dual-port version of this internal PC card lets a print server connect six parallel printers to a client PC using NetWare 3.x (or four printers using 2.x).

 ON READER SERVICE CARD

and a dual-port for \$695.

LANsprint has four utility programs: LSCONFIG configures printers and print queues, LSINSTALL adds or changes printers on a file server, LSREMOTE loads the TSR that connects printers to the network, and the utility LSWRKSTN adds or changes printers on a client PC.

Novell's PCONSOLE handles real-time management. LSINSTALL and LSWRKSTN provide hardware management. Both check for the port-status register (on- or off-line), board interrupts to which the PC can respond, and DMA (direct memory access) conflicts.

We did experience problems when running LANsprint as a nondedicated print server under Microsoft Windows 3.1 in Enhanced mode. We had to exit Windows to output the print job. If you load the TSR from within Windows, you won't run into this problem, however.

Although installation is simple, the manuals are written for NetWare 2.x users. The package includes two addenda for NetWare 3.x, but they complicate the procedure by referring you back to specific pages in the original manuals.

LANsprint's easy installation, diagnostic utilities, and adequate perfor-



FACT FILE

JetPress

LANpress

Castelle Inc., 3255-3 Scott Blvd., Santa Clara, CA 95054; 800-359-7654

List price: JetPress, \$595; LANpress, \$895

Requires: JetPress: HP LaserJet II, IID, III, or IIID. LANpress: any printer with parallel or serial port.

In short: The LANpress is an external device that can connect up to four printers; the JetPress card installs into a printer slot. Their encryption features help ensure network security

 ON READER SERVICE CARD

"LANtastic wrote the book on easy CD-ROM networking"

— ACCESS PENNSYLVANIA



THE BIG SWITCH INTERVIEW #9

as **THE** network solution not only for libraries of all types, but as **the** network solution for all purposes."

For more information, call 1-800-TINY RAM, ext. 600. We'll tell you all about the LANtastic networking system, the award-winning leader in peer-to-peer networking for DOS and Windows™ environments. We'll also send you a free demo disk and refer you to the Artisoft Authorized Five Star™ reseller near you.

ACCESS PENNSYLVANIA needed a computer network that would allow hundreds of school and public libraries across the state to share CD-ROMs, printers and other peripherals. Their goal was to find one that was reliable, affordable, feature-rich and easy to use.

The ACCESS PENNSYLVANIA Database was organized and funded by the Pennsylvania Department of Education and the State Library. "(It) represents the largest CD-ROM union catalogue installation in the world, with more than 1,000 libraries," says Charlene M. Scheib, director of ACCESS PENNSYLVANIA Support.

After months of investigating and testing many systems, including NetWare®, they homed in on the LANtastic Network Operating System.

Why? Ms. Scheib explains: "We chose LANtastic for several reasons: LANtastic is cost-effective, easy to install, requires little technical support and provides quick, direct access to CD-ROM mass-storage devices. We see LANtastic

WHY BUY FROM ARTISOFT?

- ▼ FREE unlimited technical support to registered end users and dealers
- ▼ 30-day money-back guarantee on all Artisoft™ products
- ▼ 5-year limited warranty on all Artisoft hardware

LANTIMES
READERS
CHOICE
1992

PC
MAGAZINE
EDITORS'
CHOICE
April 14, 1992
LANtastic: Version 4.10

1992
MAGAZINE
PRODUCTS
OF THE YEAR

ARTISOFT

Revolutionizing Connectivity

691 East River Road, Tucson, AZ 85704
Sales/Customer Service 1-800-TINY RAM, ext. 600

© 1992 ARTISOFT, INC. All rights reserved. Artisoft is a trademark. Artisoft Authorized Five Star is a service mark and LANtastic is a registered trademark of Artisoft, Inc. NetWare is a registered trademark of Novell, Inc. Windows is a trademark of Microsoft Corporation.

**AUTHORIZED
RESELLER**

CIRCLE 254 ON READER SERVICE CARD

NETWORKING

Print Servers

mance help make it an attractive product. But Digital Products still needs to improve the documentation for NetWare 3.x users, add more administrative features, and fix the problems with Windows 3.1 in Enhanced mode.

Extended Systems Inc.

ExtendNet 2856

Pocket Printer Server

BY STEVEN C.M. CHEN

One size doesn't fit all at Extended Systems: The company has a variety of offerings for a variety of needs.

ExtendNet 2856 provides transparent switching between PCL and PostScript, plus Mac interconnectivity, for \$695 to \$795. And if you're looking for a plug-and-print solution, the company's Pocket Printer Server should be at the top of

your list. It costs \$495 for Ethernet, \$995 for Token-Ring.

The Pocket Print Server is a palm-size external print server that connects to a printer's parallel port. The ExtendNet 2856 is an internal printer card for the HP LaserJet II, IID, III, or IIID. Its PostScript-switching feature requires HP's PostScript Cartridge Plus, but the ExtendNet card lacks PostScript Level II support for binary sends.

Installation of both products is straightforward and relies on PCONSOLE. Both packages act as PSERVER devices. You must unencrypt passwords for either print server to get Bindery information. For some networks, this may be an unacceptable security risk. To manage and configure the Pocket Printer Server as a PSERVER or RPRINTER, you use Extended Systems' management tool, the Printer Manager Utility (PMAN).

Problems can arise. At first, the ExtendNet did not print on our LaserJet III with its PostScript Plus Cartridge. The ExtendNet's lack of support for binary sends in PostScript Level II was the culprit; Extended Systems is working on a revision. When we turned off the binary-send feature, everything worked fine, except for the slowdown in printer speed. The convenient PCL/PostScript-switching feature takes a few seconds before the printer resets, but offers the advantage of automatically switching to the right printer language if users send a PostScript job to a PCL queue or vice versa.

The Pocket Printer Server's outstanding features and low cost make it a great buy. And despite the lack of PS Level II binary-send support, the ExtendNet 2856 is a good choice as well.

Fresh Technology Co.

Printer Assist, Version 4.2F

BY TONY POMPILI

Fresh Technology's \$249 Printer Assist delivers low-priced NetWare queue management to Windows 3.1 users.

Printer Assist runs as a dedicated or nondedicated print server, using only about 10K of RAM. A simple reporting utility, Pareport, displays the log file. Pareport can sort its reports by date, queue, or user, a handy feature for deter-

FACT FILE

Printer Assist, Version 4.2F

Fresh Technology Co., Gilbert, AZ 85234;

800-793-7374, 602-497-4200;

fax, 602-497-4242

List price: \$249

Requires: 5K RAM, any parallel or serial printer, NetWare 2.10 or later.

In short: Printer Assist, a software-only product, delivers NetWare queue management to



Windows 3.1 users. Printer Assist's queue management and basic tracking features make print-server management simpler for network administrators and other users.

 ON READER SERVICE CARD

mining which printers get the most usage and which users do the most printing.

Along with reports, Printer Assist provides a real-time view of print-job status. Information displayed on one screen, the Printer Information Viewscreen, includes the print queue, the user name, the print speed, and whether the printer is on- or off-line. The Viewscreen also lets you stop, restart, and delete jobs.

The Viewscreen won't always display specifics, however. It will report such problems as paper out or paper jam, but will only say whether the printer is on-line, off-line, or busy.

For GUI users, a Windows 3.1 version of the Viewscreen provides basic status information about one printer at a time. The DOS version lets users see information about multiple printers.

Printer Assist provides useful print-server management for an environment in which a rich assortment of print jobs need tight control and monitoring.

Hewlett-Packard Co.

HP JetDirect Card for Ethernet

BY ROBIN T. SOTO

The \$695 HP JetDirect Card for Ethernet gives your LaserJet a direct connection to the network. And installing it is a breeze: Simply slide the JetDirect Card in your HP LaserJet II, IID, III, or IIID, and your printer is connected to a thin-LAN or 10BaseT network. Hewlett-



FACT FILE

ExtendNet 2856

Pocket Printer Server

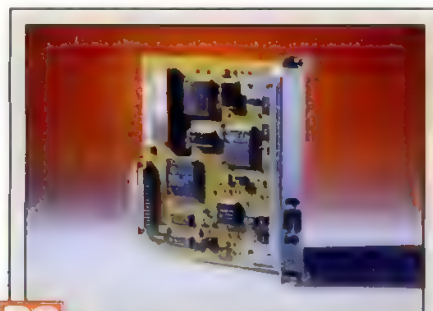
*Extended Systems Inc., 6123 Meeker Ave.,
Boise, ID 83704; 800-235-7576,
208-322-7575; fax, 406-587-9170*

List price: ExtendNet 2856: 10BaseT and thin coax configuration, \$695; AUJ-only configuration, \$795; HP LaserJet IIISi configuration, \$695. Pocket Printer Server: 10BaseT and thin coax configuration, \$495; Token-Ring configuration, \$995.

Requires: ExtendNet 2856: HP LaserJet II, IID, III, or IIID. Pocket Printer Server: any parallel printer.

In short: The ExtendNet, an adapter card that fits inside a printer slot, is a dedicated print server that offers automatic language-switching between PCL and PostScript. It supports EtherTalk, and NetWare Lite, 2.x, and 3.x, simultaneously. The Pocket Printer Server is a lower-cost plug-and-play dedicated print server.

 ON READER SERVICE CARD



PC
EDITOR'S
CHOICE

FACT FILE

HP JetDirect Card for Ethernet

Hewlett-Packard Co., 19310 Pruneridge
Ave., Cupertino, CA 95014; 800-752-0900,
208-323-2551; fax, 208-344-4809

List price: Ethernet version, \$695; Token-Ring version,
\$895.

Requires: PSERVER 1.2 or later, NetWare 2.15 or later.

In short: The HP JetDirect Card for Ethernet conserves
network resources by connecting directly to the net-
work from within a slot on a LaserJet printer. This setup
eliminates the need for a print-server station. The prod-
uct also provides LAN supervisors with the option of
installing it as a standard print server if they want to
connect the printer to a client PC.



Packard's manual helps keep the proce-
dure clear.

The adapter card can be installed in
two modes: queue-server or remote-
printer (RPRINTER). We chose to use
queue-server mode. In this mode, the
printer connects directly to the network
and can access the print queue directly,
thus improving printing speed.

Printer administration isn't extensive.
Users are notified if they've submitted
print jobs to an off-line printer. Supervi-
sors can gain additional printer informa-
tion by running PCONFIG or the Com-
Check diagnostic utility. They can also
press a button on the adapter card to
print out information on the status and
configuration of the adapter card and the
network.

HP provides a one-year warranty
that's expandable if you buy the product
with a LaserJet. Your first line of support
is your dealer, but HP also provides free
support at a toll number from 7:00 A.M.
to 6:00 P.M. Mountain time; the company
operates a CompuServe forum as well.

The JetDirect card adds flexible net-

work capability to a LaserJet without the
need for a print-server PC. Its easy instal-
lation is another asset.

Intel Corp.

NetPort II Print Server LANSpool Software for NetWare, Version 3.50a

BY ROBERT ANTHONY

Intel, the people who sell more micro-
processors than you can shake a stick at
also offer hardware and software print
servers: the NetPort II Print Server and
LANSpool Software for NetWare, Ver-
sion 3.50a.



FACT FILE

NetPort II Print Server

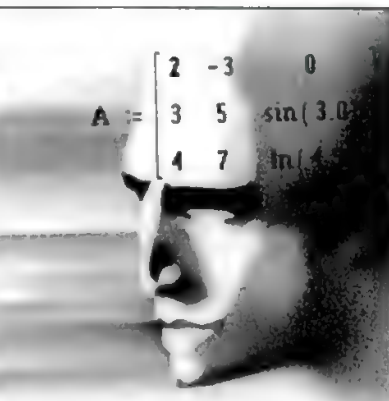
LANSpool Software for NetWare, Version 3.50a

Intel Corp., 5200 NE Elam Young Pkwy.,
Hillsboro, OR 97124-6497; 800-538-3373,
503-629-7354; fax, 800-458-6231;
fax back, 800-525-3019

List price: NetPort II: thin and thick coax Ethernet,
\$699; 10BaseT, \$699; Token-Ring, \$999. LANSpool:
NetWare 3.x version, \$599; NetWare 2.x version, \$399

Requires: NetPort II: NetWare 2.x, 3.x or later,
PSERVER 1.1 and PCONSOLE 1.21 or later LANSpool:
File server—NetWare 2.11 or later, 150K RAM for 40
shared printers; NetWare 3.x or later, 300K RAM for
60 shared printers. Client PC—2.5K RAM for each
shared printer, DOS 3.0 or later.

In short: The NetPort II's solid performance on our
tests and the device's ability to be moved around with-
out reconfiguration make it useful in LANs with a few
heavily used printers. LANSpool's easy-to-use soft-
ware, excellent throughput, and network fax-transmis-
sion utility make it a versatile product.



COMPLETE MASTERY OVER TECHNICAL CALCULATIONS

New Mathcad® Version 3.1... Fast, Easy, Accurate

With new Mathcad Version 3.1, you'll
do more math, more easily and
communicate more clearly. It literally
turns your computer screen into a
"smart" math scratchpad.

- Writes and solves virtually any
mathematical equation, numerically
or symbolically.
- Easily prints out presentation-quality
equations and graphics along with
your explanatory text, to make you
a more skilled communicator.
- Uses powerful Object Linking
and Embedding (OLE) Client to
directly interface with your
spreadsheet, drawing, and word
processing software.
- Allows "what if" calculating, so you
derive better answers.
- Microsoft® Windows™ environment
increases ease of use. Also
available for Macintosh and UNIX.

Call 1-800-628-4223

For more information and a free demo disk.
Or call

1-617-577-1017,
or fax the coupon
below to
1-617-577-8829

☐ YES! Tell me
more about
Mathcad 3.1

Please send my FREE Mathcad 3.1
Information Kit and Demo Disk to the
address below.

Disk Size ☐ 3 1/2" ☐ 5 1/4"

Name

Title

Co./Inst.

Address

City/State/Zip

Phone ()

Math Soft Please mail this coupon to
MathSoft, Inc., 201 Broadway,
Cambridge MA 02139 USA
PCMG3

Intel aims its external dedicated product, the \$699 NetPort II (\$999 for Token-Ring), at LANs on which many users share a few busy printers. Its LANSpool software (\$599 for NetWare 3.x; \$399 for NetWare 2.x) is targeted at LANs with many printers that are each shared by a few users.

Since the NetPort II connects the printer directly to the network, you can place the NetPort II anywhere on a LAN. But it doesn't make sense to scatter NetPorts around an office, since a software product such as LANSpool can spread the work around more economically if there are numerous printers. LANSpool requires that you connect your printers directly to client PCs.

The NetPort II is small and easy to install. It provides one serial and two parallel ports, but only two of the three ports can be active at a time. You can upgrade the NetPort's internal software through its programmable flash memory, and you can upgrade all network NetPorts at the same time. A green light blinks to signal trouble, and two green LEDs tell you when the product is on-line.

LANSpool Software for NetWare functions as a nondedicated or dedicated print server. It also includes network fax software, LANSpool FAX, which works with an Intel SatisFAXtion board or a Hewlett-Packard LaserJet Fax. LANSpool can access print queues on as many as 32 file servers under NetWare 3.x and eight under 2.x.

Both products provide administrative utilities. NetPort II's management program uses pull-down menus to help you monitor the queue easily. Two additional print-control utilities and a printer-status utility are included with LANSpool. The NetPort II and LANSpool are solid, easy-to-use choices for spreading print jobs across the network.

LANQuest Labs

LANscript, Version 2.01

BY TONY POMPILI

High-speed output is the best thing about LANQuest Groups' LANscript print server. And although it's a bit pricey and limited in management features, it has another plus: The LANscript can make any HP LaserJet II or III output PCL5



PC FACT FILE
EDITOR'S CHOICE **LANscript, Version 2.01**
LANQuest Labs, 2225 Qume Dr., San Jose, CA 95131; 800-487-7779, 408-894-1000; fax, 408-894-1001

List price: 5-printer version, \$2,495; 10-printer version, \$3,495
Requires: AT bus on host, NetWare 2.15 or later.
In short: LANscript, a combination of a PC add-in card, printer I/O adapter, and software, provides specialized high-speed PCL5 and PostScript printing, even on older LaserJet IIs and non-PostScript LaserJet IIIs. It's a bit pricey to be used as a general-purpose print server, however.

 ON READER SERVICE CARD

and PostScript documents, even if the printer lacks a PostScript cartridge or built-in interpreter. Prices start at \$2,495.

The LANscript is a combination of a PC add-in card, a printer I/O adapter, and print-server software. Its performance depends on a high-speed processing engine that converts PCL5 and PostScript documents to images ready to be sent directly to the print engine.

By handling this conversion itself, LANscript can automatically detect whether the document is formatted in PCL5 or PostScript. This prevents you from printing out garbage by mistakenly sending an incorrectly formatted document to the wrong queue. We found that this option requires a Windows PostScript driver, Version 3.43, to function.

LANscript can also use its preprocessing engine to enable old HP II printers without PostScript cartridges to output PCL5 or PostScript documents. The LANscript print-server software sends its rasterized documents to NetWare print queues where a remote print-server product, such as PS-Print, or PSERVER for example, can forward the job to the HP II. This process takes a while (about

72 seconds per page) and because the software is sending a rasterized image, the product's network utilization can increase dramatically.

LANscript relies on PCONSOLE for its setup and management. Thus, LANscript lacks such important queue-management options as prioritizing, deleting, and reordering jobs. LANQuest should also provide better feedback on printer status. The product does not report when the printer is on-line, when it is out of paper, or when paper is jammed.

LANscript has some limitations, but for anyone who needs high-speed graphics printing, it's hard to beat.

Novell Inc.

PSERVER.NLM, Version 1.26

BY STEVEN C. M. CHEN

The best print server may be one you already have. Novell's PSERVER comes free with NetWare and has probably been serving faithfully on thousands of printer networks. If you're printing text files, PSERVER's performance is more than adequate. But with graphics files, PSERVER slows down dramatically.

Installing PSERVER is not difficult. Novell's manual contains excellent step-by-step instructions. PSERVER can handle as many as 16 printers. You can attach five of them directly to the file server, but chances are you won't want a cluster. You can assign remote printers, either attaching them to a PC by running Novell's

FACT FILE

PSERVER.NLM, Version 1.26
Novell Inc., 122 E. 1700 South, Provo UT 84606; 800-453-1267, 801-429-7000; fax, 801-429-5775

List price: Software included with NetWare 3.11.
Requires: NetWare 3.1.x
In short: Novell's own print-server solution comes bundled with NetWare. PSERVER NLM uses a lot of CPU overhead on the file server; Novell also provides a version you can run on client PCs, PSERVER.EXE, however. Another version, PSERVER.VAP, ships with NetWare 2.x. You can't beat the price, and the other bundled utilities NetWare offers for monitoring the print server give you adequate information.

 ON READER SERVICE CARD

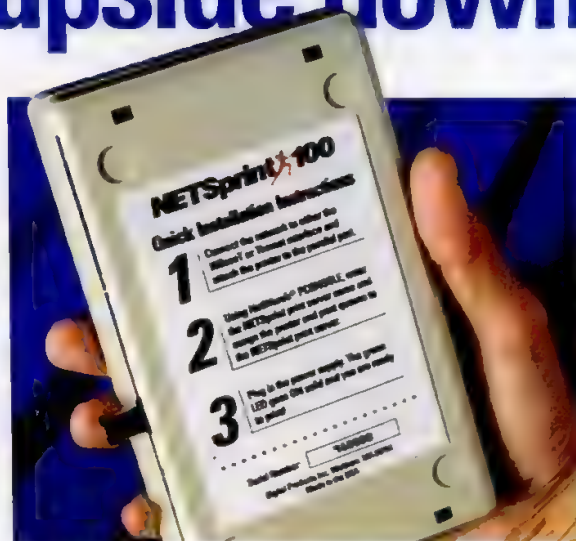
We're turning LAN printing upside down.

Nothing's faster.

Faster, easier LAN printing is within your grasp with the NETSprint™ family of print servers.

Installation is this easy: Just plug in the cables, create a Print Server with Novell's PConsole and turn the unit on. NETSprint automatically starts to service up to two printers simultaneously.

With an advanced 68340 chip, DMA and a maximum throughput speed of over 200,000 Bps, NETSprint has the power for today's graphics-intensive jobs. It maximizes user productivity and even lowers the number of LAN printers you need.



NETSprint print server installation is this easy.

Our new JETSprint™ family of internal print servers installs easily into the MIO slot of Hewlett-Packard printers such as the new LaserJet 4 and the IIISI.

What are you waiting for?

NETSprint and JETSprint. The first print servers for growing, changing LANs. Both are distributed worldwide. For product brochures and the reseller nearest you, call TOLL FREE.

1-800-243-2333



Easy now. Easy later.

With NETSprint/100 you can make any printer a network printer and locate it in minutes anywhere on a Novell LAN—Ethernet or Token Ring. You don't need a PC or add-in cards and you don't have to bring down your file server. Plus NETSprint/100 includes Flash ROM to support new features and performance upgrades.

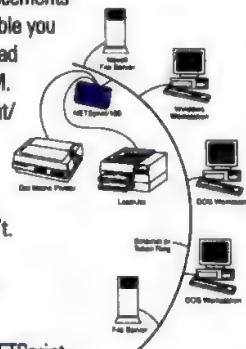
NETSprint/200, the industry's first multiprotocol print server, supports mixed network operating systems. With the 200, networked

Macs, UNIX workstations and Novell PCs can share up to four printers simultaneously.

As support for additional protocols and network enhancements become available you simply download into Flash ROM. With NETSprint/200, as your LAN grows your printing problems won't.

Pick your server.

With the NETSprint family you get a wide range of full-featured, flexible print server solutions. NETSprint supports all popular industry-standard serial and parallel printers.



Model	Network Connections	Network Operating System	Printer Connections (up to 4)	Memory	Price
NETSprint 100	Ethernet 10BaseT and BNC Transceiver 4/10MB Token Ring DB9 and RJ45	Single Novell	1-parallel RJ45 Uniprot	512K Flash ROM 512K RAM	\$895 (E) \$895 (T)
NETSprint 200	Ethernet 10BaseT and BNC Transceiver 4/10MB Token Ring DB9 and RJ45	Multiple Novell Apple*	3-parallel RJ45 Uniprot	512K Flash ROM 512K RAM	\$995 (E) \$1495 (T)
JETSprint 100	Ethernet 10BaseT and BNC Transceiver 4/10MB Token Ring DB9 and RJ45	Single Novell	1-Apple II interface	512K ROM 512K RAM	\$895 (E) \$895 (T)
JETSprint 200	Ethernet 10BaseT and BNC Transceiver 4/10MB Token Ring DB9 and RJ45	Multiple Novell Apple*	1-Apple II interface 1-RJ45 Uniprot	512K Flash ROM 512K RAM	\$795 (E) \$1395 (T)

*Apple protocol \$195. TCP/IP protocol \$195 (E) \$295 (T)

To connect LocalTalk printers to Ethernet or Token Ring LANs, ask us about SprintTALK.



NETSprint™

The first print servers for growing, changing LANs.



Digital Products, Inc.

the leader in networked printing and peripheral sharing

411 Waverley Oaks Road, Waltham, MA 02154
(617) 647-1234 / (800) 243-2333 / FAX (617) 647-4474

NETSprint, JETSprint, SprintTALK and the Digital Products name and logo are trademarks of Digital Products, Inc. All other company and product names are trademarks of their respective corporations.

CIRCLE 002 ON READER SERVICE CARD

NETWORKING

Print Servers

RPRINTER.EXE program, or using dedicated hardware-based print servers that are set up in RPRINTER mode. One new bonus: The latest version of PSERVER.NLM (available on Novell's NetWare area on CompuServe) lets you adjust the polling time to reduce the interval between print jobs.

PSERVER.NLM demands a lot from your file server's CPU, though. You can boost file-server performance by relocating the print server to a remote PC running PSERVER.EXE, but you'll also increase network traffic.

PSERVER may be hard to beat, particularly since you've already paid for it.

Software Directions Inc.

PrintQ LAN, Version 1.14

BY TONY POMPILI

Software Directions' PrintQ LAN, Version 1.14, will satisfy even the most sophisticated power user with its flexibility and performance. Because it bypasses Novell's print architecture, however, the

network manager cannot control print resources from a centralized console.

PrintQ LAN is software that runs from \$495 for a four-user version to \$2,995 for 100 users. Unlike other products in this review, it operates independently of the NetWare print architecture. Print queues, for example, are maintained on each user's hard disk, not the file server. These queues are serviced by a TSR on each PC and on the print server.

Bypassing Novell's print architecture brings impressive performance. What's more, PrintQ LAN lets you define forms, page sizes, and fonts.

PrintQ LAN's management capabilities show the downside of not using Novell's printing architecture. There is no way to limit certain printers to specific users or groups: All users can hold or delete print jobs or modify the number of copies, redirect their local I/O ports to PrintQ LAN print servers, and view a status screen indicating the filename, queue, percent of job printed, and printer status.

What's more, the client-side TSR is memory-hungry, taking about 41K of

RAM, though it does load into high memory. The Windows 3.1 version uses approximately 87K.

PrintQ LAN is great for users wanting good network performance and total

FACT FILE

PrintQ LAN, Version 1.14

Software Directions Inc., 1572 Sussex Tpk.,
Randolph, NJ 07869; 800-346-7638,
201-584-8466; fax, 201-584-7771



List price: 4 users, \$495; 10 users, \$695; 20 users, \$995; 50 users, \$1,995; 100 users, \$2,995.

Requires: Any NetBIOS- or IPX-based network; 35K on client PCs without printers, 58K on client PCs acting as printer servers.

In short: PrintQ LAN, a software-only product, has enough flexibility and performance for even the most sophisticated user. But its decentralized topology and distinctive architecture may not be suitable for every NetWare environment.

 ON READER SERVICE CARD

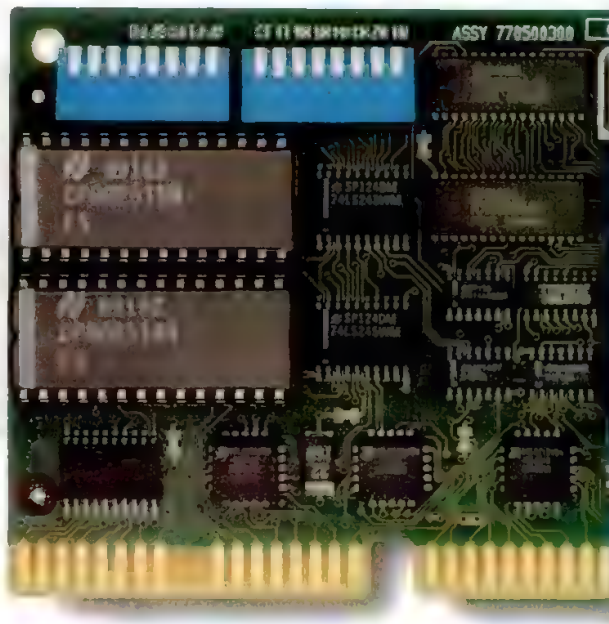
Thin and green on the outside

If you're wondering how a Token Ring adapter can look like a 3Com® board but act like an IBM® board, there's a simple explanation. They share the exact same chip.

Introducing the first true alternative for all your PCs: the new TokenLink® III 16/4 adapters from 3Com.

TokenLink III adapters are guaranteed 100 percent IBM compatible. Or your money back.

TokenLink III adapters use the IBM designed and manufactured TROPIC™ chip for full compatibility with all IBM applications. And they come with a universal boot PROM, so you can download existing IBM drivers from all the popular network operating systems. There are TokenLink III adapters for 32-bit EISA, 16-bit ISA, and 16-bit Micro Channel®



©1992 3Com Corp. (408) 764-5000. 3Com, Networks That Go the Distance, and TokenLink are trademarks of 3Com Corp. IBM and Micro Channel are registered trademarks of International Business Machines Corp. TROPIC is a trademark of National Semiconductor Co.

printing control, but PrintQ LAN's architecture will probably appear chaotic to some LAN administrators.

Third Planet Software Inc.

Network Assistant Plus VAP/NLM, Version 5.04

BY ROBERT ANTHONY

Although it's been around for eight years, Network Assistant Plus VAP/NLM, Version 5.04, isn't nearly as well known as several of the other print servers that are reviewed here. Now sold by Third Planet Software, this seasoned veteran performed well in our text-printing tests, but slowed considerably when handling PCL graphics.

Targeted at Novell users who need to

make better use of client-station printers, the \$435 software package scores points for its small (14K) but versatile pop-up management utility, NA.COM.

To install Network Assistant Plus, you load a 2.1K terminate-and-stay resident program called NAP at a client PC, once for each attached printer. The node running the TSR can act as a PSERVER device. Client stations without printers use NA.COM, not NAP, to report the current printer destination and get instant access to an extensive menu of options.

The NA.COM utility allows users to release or cancel print jobs, configure capture flags, display current printer fonts, display or modify printer queues, and perform many other functions.

NA.COM's functions are also accessible through command-line instructions.

Network Assistant Plus is an easy way

*Network Assistant Plus
performed well when
printing text, but
slowed down when
handling PCL graphics.*

FACT FILE

Network Assistant Plus VAP/ NLM, Version 5.04

Third Planet Software Inc., 9911 West Pico
Blvd., #1001, Los Angeles, CA 90035;
310-553-2808; fax, 310-553-1830

List price: \$435.

Requires: 12.5K on client PC,
NetWare 2.12 or later.

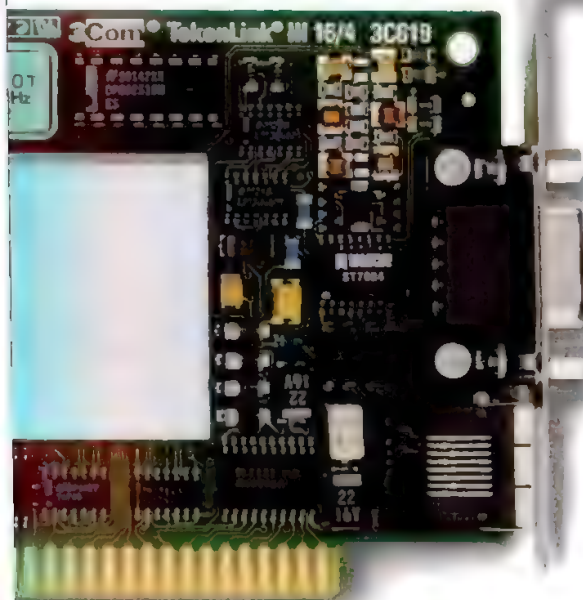
In short: Network Assistant
Plus, a software-only product,
provides a long list of menu se-
lections and command-line func-

tions, including a chat mode for users and a setting that allows you to configure how much of its time the computer should devote to printing or to other applications. The product did well printing text, but slowed down on PCL graphics.

ON READER SERVICE CARD

to make better use of client-station printers, but it is probably not appropriate if your users often print large PCL graphics files. □

big and blue on the inside.



machines. And they work with shielded twisted-pair, or even unshielded twisted-pair at 4 or 16 Mbps.

And like the rest of 3Com's five million installed adapters, TokenLink III boards give you unquestioned reliability. In fact, they even come with a lifetime warranty.

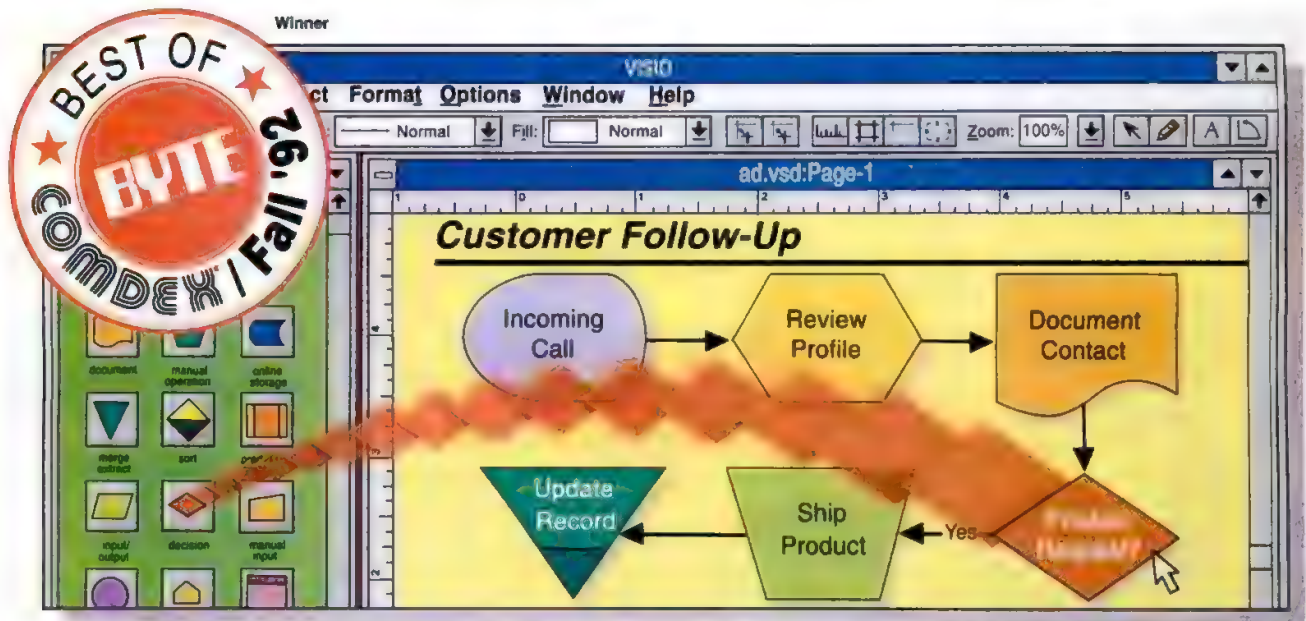
To learn more about 3Com's TokenLink III adapters, call 1-800-NET-3Com. And discover where IBM has let its chips fall.



Networks That Go the Distance™

CIRCLE 293 ON READER SERVICE CARD

VISIO IS FOR ANYONE WHO THINKS DRAWING IS A DRAG.

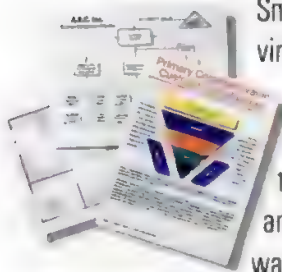


Now you don't have to be a graphic artist or draftsman to create impactful business and technical drawings. Because *if you can drag and drop, you can draw*. It's easy with Visio™, Shapeware's new drawing program for Microsoft® Windows™ 3.1 users.



By just clicking your mouse, Visio lets you drag and drop shapes, change their size or color, connect them automatically and type in text. Drag. Drop. Done! It's that easy.

Only Visio gives you more than 300 drag and drop SmartShapes™ to help you create virtually any drawing or diagram.



Unlike clip art, SmartShapes are "intelligent." They can take on different forms, colors, and proportions and behave the way you expect. And with

Visio's simplified tool set, you can easily create your own customized shapes using a single pencil tool.

For easy access, SmartShapes appear right on your screen on job-related "stencils." Each stencil features all the shapes you could possibly need for your specific drawing.

There's a Visio stencil for flowcharts. One for space plans. Organizational charts. Business models. Marketing diagrams. Gantt charts. Computer network layouts. Engineering schematics. And direction maps. Visio includes 15 stencils, standard. And you can also get additional stencils for more specific jobs.



So if you need to concentrate on *what* you want to draw, not *how* to draw it, you need new Visio from Shapeware. The only Windows software that lets you draw from more than your imagination.

SPECIAL CHARTER OFFER.

Buy Visio now for just \$249. And if you order and register by April 30, 1993, you'll also receive: ■ An additional Visio stencil set of your choice ■ A free issue of *Windows*, *Windows Sources*, and *Windows User* magazines ■ Free technical phone support for 90 days ■ A 60-day money-back guarantee. To order Visio, or for the names of authorized Visio resellers near you, call toll-free:

1-800-446-3335, ext. BA1



CIRCLE 008 ON READER SERVICE CARD

NONPROGRAMMABLE DATABASES

Power Without Pain

What a difference a year makes! Not a single product in our last review of nonprogrammable databases ("Database Power Without the Programming," December 17, 1991) was Windows-based. Today, fully half of the ten products we reviewed run under Microsoft Windows, Version 3.x. Along with GUI (graphical user interface) support comes a host of new features and capabilities that blur the line between low-end and high-end database systems. These products can handle everything from simple mailing lists to sophisticated multilevel lookups and reports. And, at prices ranging from \$150 to \$550, they're only a fraction of the cost of their programmable siblings.

The trend toward making Windows the interface of choice in the nonprogrammable database category



If you thought nonprogrammable databases couldn't get any real work done, then think again. The new crop is handsome, easy to use, and powerful.

IN THIS REVIEW

<i>AceFile 2.0 for Windows</i>	278
<i>Alpha Four</i>	284
<i>Approach for Windows</i>	286
<i>DataEase Express for Windows</i>	290
<i>FileMaker Pro 2.0 for Windows</i>	292
<i>PC-File</i>	293
<i>PrimaBase</i>	294
<i>PRO-dVelBase</i>	303
<i>Q&A</i>	308
<i>Ultra-Plus</i>	310

by Sheryl Canter and Joe Salemi

Nonprogrammable Databases

is unmistakable. Most of the DOS products in our last review of nonprogrammables have not had significant upgrades. Nor are there new products for OS/2; Alpha Four, Version 2.1, stands alone as the only nonprogrammable database system with a version for OS/2. (The OS/2 version was written for OS/2 1.x, and runs in character mode.) For now, in nonprogrammable database systems, almost all the action is in the Windows arena.

NONPROGRAMMABLE BUT POWERFUL

In the past we called this category "flat-file databases" because they stored data in a single table. Last year we changed the name of the category to nonprogrammable databases because, even though many people still use these products for flat-file applications, the flat-file limitation has disappeared.

Even the term "nonprogrammable" is a bit misleading. While none of the packages we review has full-blown programming languages, most have some type of macro or scripting capabilities. We consider a database system to be nonprogrammable if it gives the user a way to access and manipulate data without having to write code and if it does not come

with a full-scale programming language. Macro and script capabilities are then an added bonus, not a necessity.

These products are still well-suited for simple tasks such as printing mailing labels and creating mail-merged letters, but many offer more advanced features such as security and connectivity to SQL databases, all without any programming.

GUI support in nonprogrammables has raised ease-of-use to new heights. The Windows products all use a visually oriented model for creating custom forms and reports. You place text, data fields, and other interface objects in a form or report simply by dragging the object to the proper place and dropping it there. An object can be easily enhanced by changing properties such as fonts and colors. And you can use Windows' DDE (Dynamic Data Exchange) and OLE (Object Linking and Embedding) capabilities to link to other applications such as spreadsheet or paint

programs to incorporate charts or graphics. Because of this, most Windows database systems often don't include charting features, despite their graphical nature; AceFile 2.0 for Windows is the exception. It's also rare for a DOS package to support charting; PC-File is the only DOS package in this roundup to provide this capability.

GUI support in nonprogrammable database systems has raised ease-of-use to new heights for these products

NOT JUST FLAT-FILE

Flat-file databases store information in a single file. Another way to store data is in related tables. For example, you can have a customer list in one table (or file) and an order list in another table. The two lists are related by a record key such as customer number. The tables in this example are in a *one-to-many* relationship because there can be more than one order per customer.

All of the databases reviewed here have at least rudimentary lookup capabilities; that is, they can view data that is contained in more than one table. For some products, such as FileMaker Pro, PC-File, and Q&A, the multifile capability is limited to lookups. All of the other products in this review are capable of true multitable joins. That is, you can not only see data in a secondary table; you can actually modify it.

Some of the packages blur the line between low-end and high-end even further by including features such as multiuser capability (as does Alpha Four), built-in security (DataEase Express), and hooks for connecting to SQL databases (Approach)—features aimed at the corporate user. With features like these, the industrywide movement toward "power without programming" has finally reached the database market, and there is increasingly little difference in power between programmable and nonprogrammable database systems.

However, graphical interfaces and code-free development can make creating complex databases deceptively simple. While these packages make it easy to perform the necessary tasks such as creating relations between data in your tables, they can't tell you how to build

Suitability to Task: Nonprogrammable Databases

Nonprogrammable databases are more powerful and easier to use than ever before. The standard has been raised with this year's crop of new releases.

In rating each product on **database administration** we consider its ability to import and export several types of data files. We also examine the data types it supports and the functional limits pertaining to fields, records, and files. The product's integrity features, security features, and connectivity options are also important factors.

For the **queries** score we look at the querying methods the program offers, such as query by example, query by form, query languages, and menu-driven query mechanisms. Flexibility within data entry forms is also important, as are the product's multiuser locking methods and special on-screen data-viewing features (such as charting capabilities).

SUITABILITY TO TASK				
Product Name	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	○	○	○
Queries	●	●	○	○
Reports	●	●	●	○
Applications development	●	●	●	●
Applications development	N/A			

N/A—Not applicable. The product does not perform this task.

For the **reports** score we examine the product's built-in report formats, such as columnar, free-form, and cross-tabular formats. Equally important in this category is the presence of flexible mail-merge facilities and mailing-label functionality. We also take into account the product's printer support.

Although each was designed for nonprogrammers, some of these products provide features to automate tasks and create custom applications. For the **applications development** score we look at each product's macro capabilities, menu generator, scripting language, and application builder.

a well-designed database; that knowledge must come from you.



EDITORS' CHOICE

THE NEW STANDARD

Because most nonprogrammable database systems now support multitable lookups, we have limited our roundup to those products that meet the new standard. WordPerfect Corp.'s DataPerfect and LB86 from Misosys are not reviewed here because they lack the ability to access multiple files at once. Raosoft's Survey can concatenate files, but does not support one-to-many links. Survey, however, is of particular interest because of its unique menu-driven statistical capabilities. To learn more about Survey's simple solution to a complex problem, read the sidebar "Survey: A Database with Statistics."

Although vendors have not stopped supporting their DOS products entirely, seven of the ten DOS products in our last roundup (Clarion Personal Developer, File Express, Reflex, Professional File, Rapid File, Personal R:BASE, and Q&A) have not had significant upgrades since we reviewed them a year ago. Because the information in our previous reviews is still valid, we do not revisit any of these products, with the exception of Q&A. Q&A was one of last year's Editors' Choice winners (along with Alpha Four), so we have included the product in this roundup to see how it stacks up against the new crop.

FUTURE PROMISE

Database systems were one of the last DOS holdouts, but Windows products now appear to be taking the category by storm. In addition to the new nonprogrammable database systems for Windows reviewed in this story, there is also a movement toward Windows in the programmable database market. As of this writing, both Microsoft and Borland are planning to release programmable database systems (Access for Windows and Paradox for Windows, respectively) that are so intuitively designed you can do most things without resorting to the pack-

- Alpha Four, Version 2.1
- FileMaker Pro 2.0 for Windows

We have designated two nonprogrammable database systems as Editors' Choice honorees: Alpha Four and FileMaker Pro 2.0 for Windows. Alpha Software's Alpha Four (a previous Editors' Choice winner) offers a feature set that makes even compli-

cated applications easy to build. DOS-based Alpha Four is the highest priced package in this roundup, but its strengths include a logical menu structure, true table-join capability, an unusually flexible report writer, and a full-blown application builder.

If your database needs are limited to contact lists, mailing labels, mail-merge letters, and other single-file applications, you will want to use Claris Corp.'s FileMaker Pro 2.0 for Windows. Its simplicity and elegance raise the standard for ease of use. FileMaker Pro was first written for the Macintosh platform, and the Windows version uses the same file format. It provides lookup capabilities, but you cannot perform true table joins as you can with Alpha Four.

The hybrid between Alpha Four's power and FileMaker Pro's ease of use is DataEase International's Data-

Ease Express for Windows, which deserves an honorable mention. It supports true table joins and can effortlessly search on multitable data and summary fields. But despite its excellent design, this first version of the product falls short in implementation. It is missing a file import utility and suffers from numerous bugs and rough edges.

Approach for Windows, from Approach Software Corp., was one of the first Windows databases to combine sophisticated data management and ease of use. It also leads in database connectivity, with native access to dBASE, FoxPro, and Paradox file formats, and the ability to import many other formats as well. But Approach's query capability doesn't allow selection on summary variables, and selection on fields in linked files within the report writer is awkward.

age's programming capability. Thus, expect the lines between the two categories of databases to blur even further.

The resources available on the Windows platform are the driving force behind these changes. While programming for Windows can add a layer of complexity, its built-in features let vendors devote more time to improving their core product. Developers don't have to worry about writing printer drivers or special video drivers to provide fancy screen handling. The Windows graphical interface makes it much easier to produce so-

phisticated forms and reports. And DDE and OLE let users link database applications to other programs for analysis, charting, or complex mail-merge letters.

But despite their promise, we found most of the new Windows products to be immature—still suffering from the bugs and rough edges that traditionally plague new releases. Although Windows-hosted database systems are finally here, they are not yet as good as they undoubtedly will become.

In the reviews that follow, you'll find products that cover the gamut from simple database systems for casual uses to sophisticated products that approach programmable databases in capabilities. Whether you decide to stick with DOS or move to Windows, you'll find at least one product that fits your needs.

Our Contributors: SHERYL CANTER is the associate editor of the Applications Development team at *PC Magazine*. STEPHEN W. PLAIN is the project leader of the team. JOE SALEMI is a contributing editor to *PC Magazine* and the author of the *PC Magazine Guide to Client/Server Databases* from Ziff-Davis Press. WILLIAM BEEM is a PC support manager for a banking services firm in the Southeast.

Ace Software Corp.

AceFile 2.0 for Windows

BY WILLIAM BEEM

If looks were all that mattered, AceFile 2.0 for Windows, from Ace Software Corp., would be on everyone's dance card. It combines a sharp-looking user interface with a plethora of features—such as user-defined bitmap buttons and con-

text-sensitive help—designed to make data management easier for the user. Unfortunately, AceFile has some inconsistencies in its file import function and limitations in its lookup capabilities.

A FRIENDLY INTERFACE

AceFile's strong suit is its intelligent use of the Microsoft Windows interface. Navigating the package is a breeze, and both mouse and keyboard users will find equal ease of use.

Most new Windows applications sport some sort of button bar, and AceFile is no exception. Users who find icons cryptic and difficult to decipher will be pleased to note that a text description is displayed on the bottom status line whenever the cursor is over a button. For those who would rather reclaim the screen space, the button bars can be disabled.

The main menu button bar appears bland at first, with only the File and Organize options available, but menu ele-

■ Survey: A Database with Statistics

by Sheryl Canter

Raosoftware's Survey is a \$495 package that includes a questionnaire builder, data entry and management tools, and a menu-driven statistical analysis module that enables even those with a fear and loathing of statistics to quickly analyze their data.

Survey is not a full-featured database package. You can concatenate files, but you cannot create indexes or create one-to-many links between tables. Nor is it a full-fledged statistical analysis package. It lacks the ability to perform one of the most common functions in data analysis: the ability to recode responses into different groupings. For example, you cannot recode a STATE field into regions such as "Northeast" or "Southwest." Still, Survey offers a unique mix of capabilities in a solid package that is easy to use, if occasionally somewhat awkward. The menu structure, though easy enough to navigate, does not always give you quick access to options. You may have to make several selections to reach the option you are looking for.

While other flat-file database vendors are moving to Windows, Raosoftware has Survey firmly planted in the DOS world—at least for now. (Raosoftware says a Windows version of Survey is in the works.) A text-based interface of pull-down and pop-up menus is used to navigate between different modules, but the command-driven questionnaire builder and report writer buck the current trend towards visual design. The

command syntax is simple to learn and use, but for users spoiled by drag-and-drop, WYSIWYG, visual form design, it is a disappointment.

To define a questionnaire, you specify for each question a field name and type, and what kinds of responses are allowed (for example, multiple choice, check-all-that-apply, free-form response, or numeric data). The Survey questions themselves and other explanatory text can be inserted where appropriate. Once the questionnaire is defined, you can generate on-line data entry screens, a form for viewing the data, and a printed, distributable version of the questionnaire, all through simple menu selections. Data can be entered directly into the forms, where it is stored in dBASE III format, or you can import files in dBASE III, ASCII, and .WK1 formats.

Survey's statistical analysis module is feature-rich and entirely menu-driven. You can compute a full range of descriptive statistics, including the mean, standard deviation, minimum and maximum values, frequency distributions and cross-tabulation tables. For discovering whether the results you see are statistically significant, the program supports t-tests, chi-square tests, and simple correlation and regression, along with utilities for determining minimum sample size requirements and significance test cutoffs. The built-in command-driven report writer can be used to organize the results for presentations, but the output is not es-

pecially slick. Only two-dimensional bar graphs and pie charts are supported. Unless it's for internal use, you'll probably want to import the results into another package for re-formatting.

Survey's documentation is superb. Not only is it exceptional in terms of organization and clarity, but the manual includes a well-written appendix entitled "A Beginning Approach to Analysis." There is also a separate booklet, "A Practical Guide to Survey Development," which succinctly and entertainingly explains how to write good survey questions. Dr. Potluri Rao, the author of Survey, originally began development of the package as a teaching tool for his statistics classes at the University of Washington, and it shows. The documentation is not only effective in teaching users to operate the program, it is an excellent tutorial on survey design and analysis.

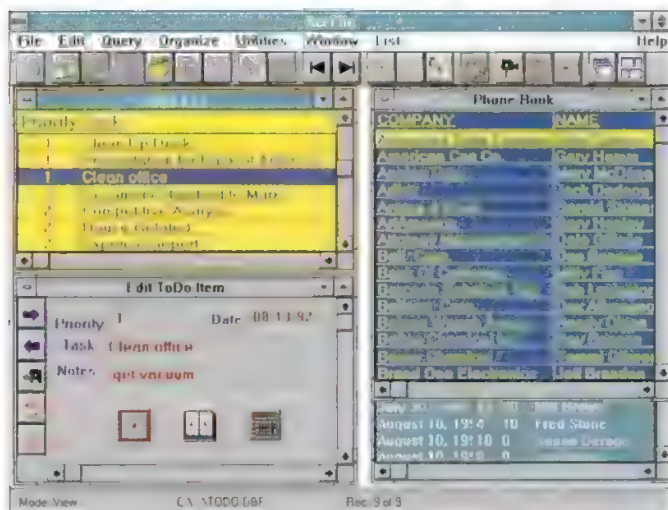
If you are a direct-mail advertiser who is tired of paying consultant's fees to discover minimum sample size requirements or whether the difference in response rate between two market tests is statistically significant, you should seriously consider investing in a copy of Raosoftware's Survey. For basic survey analysis, it's an excellent buy. □

Survey, Version 2.0

Raosoftware Inc., 6645 NE Windermere Rd., Seattle, WA 98115; 206-525-4025; fax, 206-525-4947. List price: \$495. Requires: 512K RAM, DOS 2.0 or later. Circle 497 on reader service card

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases



AceFile 2.0 for Windows lets you create stylish form buttons that can launch macros, queries, or other applications.

ments change appropriately as other options become available. When a file is opened, the bar expands to cover other features, such as Edit, Query, and Utilities. The bar also displays other options such as List, Form, Graph, or Report as appropriate to the current view.

With just the tools you need at the ready, creating an AceFile data entry screen is extremely simple. AceFile automatically displays a form view with all the fields represented; you can use this default form, or move the fields to new locations with the mouse. Among the available field options is the Bitmap Button field. This field hooks a bitmap picture (.BMP, .PCX, and .TIF file formats are supported) to a user-defined action; for example, the user could activate the telephone dialer or start a calendar program. You can also use this field to activate other Windows programs and utilities or to run a keystroke macro.

All fields can be customized with a series of predefined macro commands. You can define mandatory fields, declare data ranges, or set field values to automatically increment to help avoid data entry errors. But there are limitations: If you want to specify a social security or telephone number format for your field, you're out of luck.

NOT QUITE RELATIONAL

Although primarily intended as a flat-file product, AceFile permits one-to-one table joins. Macros are used to copy data

from other tables into a field of an entry form or report. The downside of this technique is that changes made in the entry form won't be reflected in the linked database, because only a copy of the data is being edited.

To use fields from related database tables in the same form or report, you must create a separate file including the selected fields of two related files. Unfortunately, AceFile doesn't let you know if there is already a database with the name you chose for the new file, and it will blithely overwrite it without warning.

AceFile uses the .DBF file format and allows up to 10 files to be open simultaneously. In addition to the regular .DBF field types, AceFile also supports calculated fields that hold data derived from the evaluation of an expression. Another special field type allows graphics images to be linked to the database. For instance, a file for a company's human resources department might include a picture of each employee.

One of the weakest aspects of AceFile is its file-import facility. AceFile recognizes a variety of popular file formats, including .WK1 and dBASE III-style .DBF files. Non-.DBF files are converted to .DBF format on import, but there are several inconsistencies in the process. For some file formats AceFile will create a target database on import, while for others the target database must already exist. Likewise, for some file formats AceFile will append the imported data to an existing database, but for other formats an existing file will be overwritten. These inconsistencies make AceFile a bit more

from other tables into a field of an entry form or report. The downside of this technique is that changes made in the entry form won't be reflected in the linked database, because only a copy of the data is being edited.

To use fields from related database tables in the same form or report, you must create

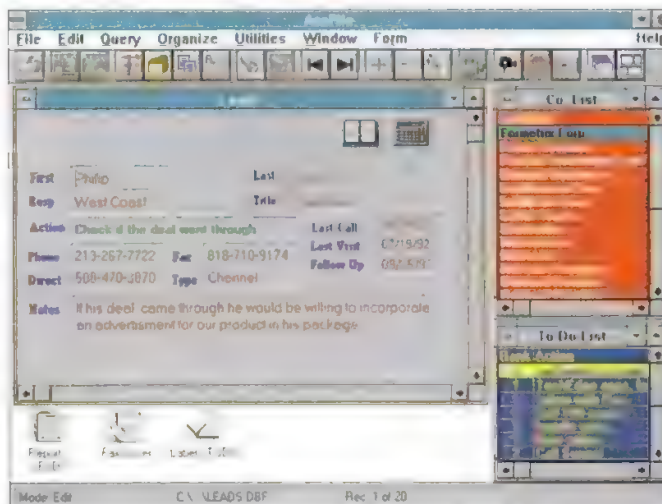
SUITABILITY TO TASK				
AceFile for Windows				
	File	Edit	Query	Report
Database administration	●	●	●	●
Queries	●	●	●	●
Reports	●	●	●	●
Applications development	N/A			

difficult to use; a little harmony here would be in order.

SNAPPY REPORTING

Building an AceFile query is a simple procedure; a dialog box allows you to enter an expression using a dBASE-like language, or you can select options from a group of pick lists, push buttons, and check boxes. The list of functions, however, is relatively limited.

AceFile has an excellent report writer that takes advantage of Windows' printer support and font capabilities. Whether you prefer columnar or free-form reports, AceFile lets you print your information in a manner that suits your needs. As with other parts of the program, the AceFile user interface makes it easy; creating a group in a report is as simple as clicking the Group icon and then drawing a rectangle around the fields to be included in the group. And creating aesthetically pleasing screen layouts and printed reports is simple, too, since shading, color, fonts, and graphics are also supported.



In AceFile 2.0 for Windows, multiple views can be simultaneously displayed in scrollable, resizable windows.

AHA! JUST AS YOU NOTEBOOKS ARE

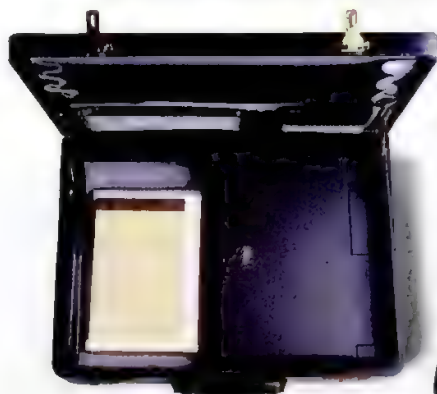
You had to suspect someone could make a great notebook for under \$2,000. And, once again, the job falls in our lap.

We're selling our 6.3-pound Dimension™ NL20

THE DIMENSION NL20 i386™ SL 20 MHz NOTEBOOK* \$1,399 Lease: \$52/MO. • 2 MB RAM • 60 MB (19 ms) Hard Drive	• Edgelit VGA LCD (8.5", 640 x 480) • 6.3 lbs. (including battery) • 8.3" x 11" x 1.8" • NiCAD Battery • 2.5-Hour Battery Life, 3.5 Hours with Power Management Enabled • MS-DOS™ 5.0
---	---



Yet another measure of a truly great computer.



At 8.3" by 11", the NL20 fits neatly into your briefcase. Right next to the wad of cash it saves you.

With a 20 MHz i386 SL processor inside, our notebook is small, but it's not wimpy.



notebook for just \$1,399. Without sacrificing the power and features you get in those more expensive machines.

So now that we've confirmed your suspicions, it's time to take action. Start by calling us to order today.

**WANT MORE? HOW ABOUT OUR
25% FASTER NOTEBOOK.**



Our NL25 packs even more power into a small space. With its 25 MHz i386 SL and a 9.5" diagonal screen for \$1,499, it was named PC World's Best Buy.

THE DIMENSION NL25 i386 SL 25 MHz NOTEBOOK* NOW \$1,499 Lease: \$55/MO. • 2 MB RAM • 60 MB (19 ms) Hard Drive • Edgelit VGA LCD (9.5", 640 x 480) • 6.3 lbs. (including battery) • 8.3" x 11" x 1.8" • NiCAD Battery • 2.5-Hour Battery Life, 3.5 Hours with Power Management Enabled • MS-DOS 5.0



If you need help you can always call us. We're in the book.

Survey was independently conducted by Reliability Ratings, Needham, MA. The data is quoted from a 40-page report available for purchase through Reliability Ratings (617) 444-5755. Reliability Ratings, the research company, is not affiliated with Dell Computer Corporation and does not endorse its products.

*Rapid Response™ Service return-to-factory. *Leasing arranged by Leasing Group, Inc. i386 is a trademark and the Intel Inside logo is a registered trademark of Intel Corporation. FORTUNE 500 is a registered trademark of The Time Inc. Magazine Company. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

SUSPECTED. MOST WAY OVERPRICED.

20 MHz i386 SL

\$1,399

LEASE: \$52/MO.

DELL™

800-678-1430

WHEN CALLING, PLEASE REFERENCE #118CG.

HOURS: 7AM-9PM CT MON-FRI, 8AM-6PM CT SAT, 10AM-3PM CT SUN.

IN CANADA, CALL 800-668-3021. IN MEXICO CITY, 228-7811

► PERFORMANCE TESTS

Nonprogrammable Databases

Nonprogrammable database systems are easier to use than ever, but are they also faster? Our tests suggest so.

HOW WE TESTED

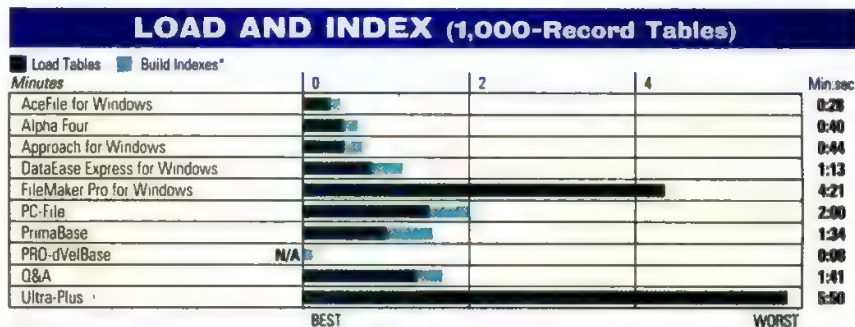
For our tests, we used two databases containing two tables each. The smaller database contained 1,000 rows per table, and the larger database contained 10,000 rows per table. The database structure was identical for both tables.

Except where noted, the data was imported from fixed-length ASCII files and converted to the database package's native file format. We provided comma-delimited and .DBF formats for products that did not support fixed-length ASCII files. All test scores of less than a second are rounded up to 1 second.

WHAT THE NUMBERS MEAN

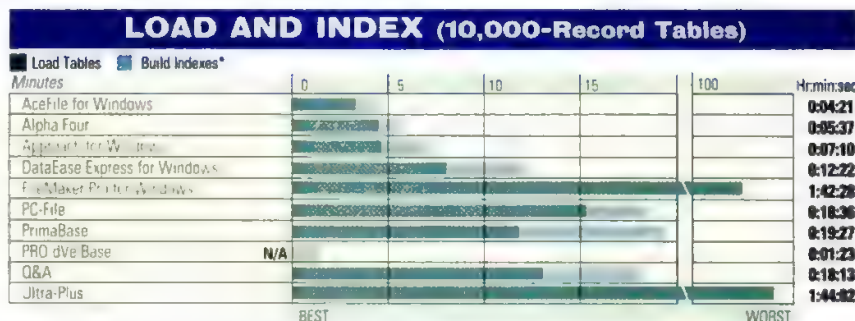
AceFile turned in the best performance on the Load and Index test. Both Alpha Four and Approach also performed well on this test. Filemaker Pro and Ultra-Plus create indexes on all fields at the time of import, so for these products the times presented for loading tables include the creation of 11 indexes. PRO-dVelBase uses the dBASE III+ .DBF file format and does not provide any means of importing from ASCII files, so the time presented represents only the building of the indexes. PC-File and PrimaBase always create a primary index while importing data, so the load times for each program include the time required to build an index on the KEY field. We tested DataEase Express using an import utility that is not included in the current release of Version 1.0 but is available from DataEase International on request.

Q&A turned in exceptionally quick times on the Select test, finishing both the numeric and alphanumeric searches of the 10,000-record database in less than 1 second. Neither PrimaBase nor PC-File allows the user to re-



N/A—Not applicable: The product could not perform this part of the test.

* Where no Build Indexes timing appears, the package automatically indexes all fields in the process of loading tables.



N/A—Not applicable: The product could not perform this part of the test.

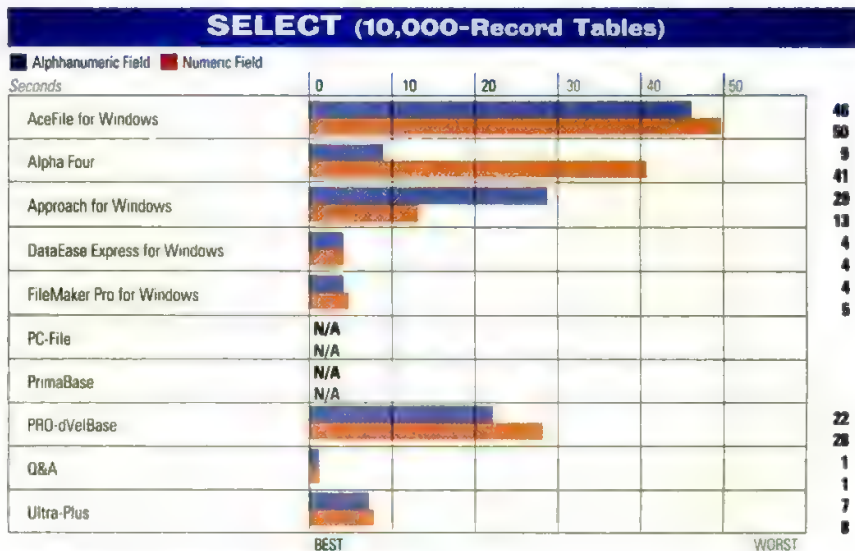
* Where no Build Indexes timing appears, the package automatically indexes all fields in the process of loading tables.

turn all the result rows of a query; the user must generate a report using a function similar to the Find Next command to show multiple instances.

PRO-dVelBase turned in the best times on the Update test. Approach took more than three times as long to

perform the global modify of records as it did to perform the global deletion. DataEase Express and PrimaBase are not able to perform global updates or deletes.

Q&A required lookups between tables and special programming of the



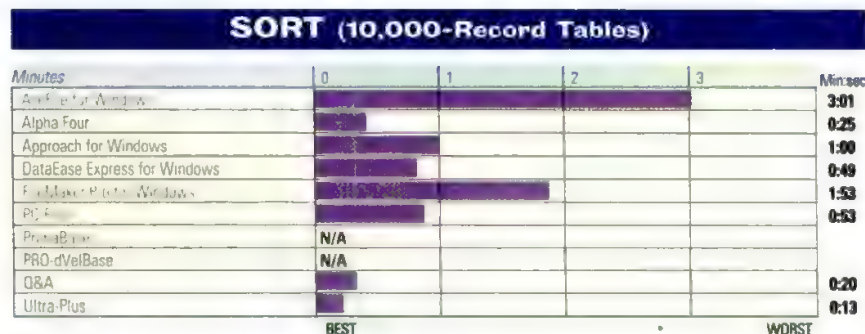
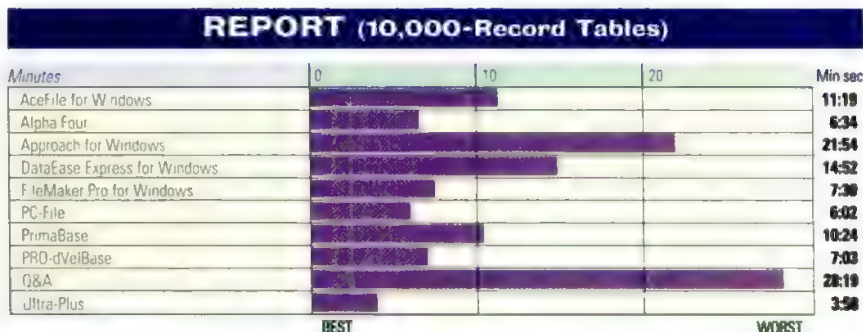
N/A—Not applicable: The product could not perform this part of the test.

report specification to calculate the subtotals that were part of our Report test. Consequently, the package took more than 28 minutes to complete the test with 10,000-record tables.

Our Sort test normally sorts on a field that has not been indexed. Because Ultra-Plus maintains indexes on all fields, it did well on our Sort test. PrimaBase cannot sort on unindexed fields, and PRO-dVelBase does not allow you to sort in descending order, so the two packages were not able to complete the test.

The **Load and Index** test measures how quickly a package loads and indexes a two-table database. The test shows the efficiency of the import routine and reflects how data types and redundancy affect indexing performance.

Except where noted, the databases import fixed-length ASCII files. Two indexes were built into each table, and in both tables the primary key index was built on the integer KEY field. In the first table, we built a secondary key index on the alphanumeric CODE field, and in the second table, we indexed the alphanumeric NAME field. All of the values in KEY and CODE were unique; they occurred only once for the field in the entire database. Only 10 percent of the values in the NAME field were unique.

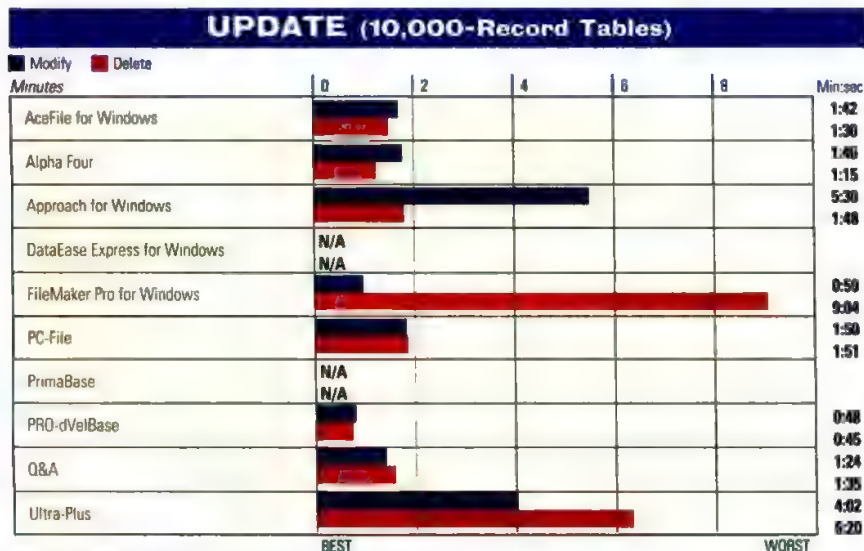


N/A—Not applicable. The product could not perform this test.

The **Select** test measures how long it takes to retrieve records based on indexed selection criteria. Selection speed depends on the storage organization and the number of selected records. To test storage organization, we ran queries on two types of indexes. The first query was based on a numeric field with unique values. The second query was based on an alphanumeric field with redundant values. Both que-

ries retrieved 10 percent of the records in a table.

The **Update** test measures how long it takes the database to modify and delete records based on indexed selection criteria. First, we selected 10 percent of the records and globally replaced the primary key value using a formula that subtracted 100,000,000 from the original value. Then we reselected the updated records and deleted them.



N/A—Not applicable. The product could not perform this part of the test.

The **Report** test shows how long it takes the package to generate a standard columnar report based on data joined from two tables. The report includes the following tasks: Join two tables based on a common key value, select two fields from the first table and two fields from the second table, sort one field in ascending order, at break-points calculate subtotals for two numeric fields and print grand totals at the end, and send the results to a print file.

The **Sort** test measures the time it takes for the database package to sort a table on an unindexed field in descending order.

Nonprogrammable Databases

FACT FILE

AceFile 2.0 for Windows

Ace Software Corp., 1740 Technology Dr.,
#680, San Jose, CA 95110;
408-451-0100, fax 408-437-1018

List price: \$199.

Requires: 2MB RAM, 3MB hard disk space, Microsoft Windows 3.x. Phone Dialer module requires a Hayes-compatible modem.

In short: AceFile 2.0 for Windows boasts an excellent user interface. Place the cursor on a toolbar icon and a status line along the bottom of the screen displays a description of the icon's function. User-definable bitmap buttons can trigger special functions or other applications. Its database functionality, however, does not meet the same high standard. Also, AceFile's import facility is inconsistent in design and awkward to use.

ON READER SERVICE CARD

CLOSE TO TARGET

AceFile is thoroughly documented; it has both a well-written manual and a liberal amount of on-screen information. The on-screen help information is context-sensitive, and once you get comfortable with the program you'll probably never need to pick up the manual again.

If not for its frustrating inconsistencies, AceFile would be a good nonprogrammable database for users with simple or moderate needs. Although the excellent user interface makes it attractive to novices, the program's quirks could frustrate them terribly. Its lack of adequate relational support and limited database functions make it ill-suited for building sophisticated applications.

Alpha Software Corp.

Alpha Four

BY STEPHEN W. PLAIN

At \$549 for the single-user LAN version and \$495 for the standalone package, Alpha Four seems at first to be a hefty investment for a nonprogrammable DOS database package. But its powerful relational capabilities, full-featured application builder, flexible report writer, and well-designed interface make it well worth the price. Alpha Software Corp.'s

product is an excellent choice for anyone looking for an easy-to-use package with the power to handle complicated applications. Version 1.1 of Alpha Four won our Editors' Choice award in last year's roundup. Version 2.1 continues the excellent track record of this five-year veteran of the marketplace.

Alpha Four 2.0 sported a powerful scripting facility that transformed the package into a true applications designer. The area of greatest enhancement in Version 2.1 is the Search/Sort facility. Arbitrary sorting orders can now be applied to any search list, which eliminates the need for indexes on the desired sorting expression. A list of the ten most recent searches is also maintained, providing a quick method of reissuing a query. The speed of searches has also been dramatically improved. Alpha Software intends to continue to update the product, and has plans for a Windows version down the road.

POLISHED AND POWERFUL

Alpha Four's user interface is made up of a well-organized system of pop-up menus. Context-sensitive help is available everywhere in the package through the F1 key. Although there is no mouse support, navigation through the menus is quick once you get used to the accelerator keys assigned to each menu. The highly polished system has useful features in all the right places. For instance, the input fields' adjustment screen, which is displayed as the program prepares to import ASCII files, shows an actual record of the selected import file. This is helpful as you adjust the starting columns and lengths of the target fields.

There is a custom menu painter, which

is relatively easy to use despite the lack of mouse support. What makes Alpha Four's implementation particularly slick is that it lets you record macros to attach to menu items while you're building the menu, instead of requiring you to create your macros in advance.

Another example of Alpha Four's



Alpha Four lets you group related tables. One-to-one links are represented by a single-line arrow, one-to-many by a double-line arrow.

power is its built-in "trigger" capability. Certain commands can automatically trigger user-defined scripts. This feature can prove very useful in applying application-specific rules to a database. For example, you could use the "record is deleted" trigger to execute a script that puts up a dialog box to confirm the deletion before actually eliminating the record.

Creating reports is a breeze. A quick-setup option will generate a default layout with labels and subtotals; you need

only select the fields. There is much flexibility in grouping parameters and calculated field types. Producing complex reports with data from multiple files is also refreshingly simple.

A letter editor lets

you create form letters that contain conditional logic for importing data. There is also an option for creating standard and customized mailing labels.

Alpha Four is highly suitable for building turnkey applications. An appli-

SUITABILITY TO TASK				
Alpha Four				
	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	●	●
Queries	●	●	●	●
Reports	●	●	●	○
Applications development	●	●	●	●

Now
\$20 Off

Work Set/2



Powerful New Tools for OS/2 Programming

The WorkFrame/2 product ... because the best environment for application development is the one you create yourself.

With WorkFrame/2, you can integrate your choice of development tools – including those for DOS and Windows. It's open, configurable and language independent. And it's easy to customize the WorkFrame/2 interface to create your own development environment.

The concept is simple. WorkFrame/2 organizes files into logical units called projects. By associating each project with your personal choice of compiler/debugger/linker/editor you can get the greatest productivity possible from all your development tools.

The C Set/2 product ... because application development should be fast – and simple!

C Set/2 delivers a one-two punch to help you create some of the fastest-performing OS/2-based applications possible.

First, the 32-bit C compiler enables your applications to exploit the speed and power of 386- and 486-based computers. It's the best high-performance code optimizer in the business. With the C Set/2 compiler, unsafe optimizations simply don't exist.

Second, C Set/2 comes with a fully interactive, full-function, source-level 32-bit Presentation Manager debugger. Just point your mouse and shoot, using the graphical PM user interface – or use the keyboard.

Either way it's easy. And you'll get instant feedback on the screen to verify what you're doing. Debugging has never been so simple!

And there's more. The C Set/2 compiler conforms to industry standards – including ANSI C and ISO/IEC – and offers Microsoft C compatibility. With features like a full suite of run-time libraries and 32-16 bit linkage, you can be sure C Set/2 will provide the function and flexibility you need to make application development fast and simple – the way it should be.

OS/2 2.0 Developer's Toolkit ... because it takes the right set of tools to build powerful applications.

OS/2 2.0 Developer's Toolkit is the perfect companion to use with C Set/2. It contains a variety of language-independent application build and productivity tools. For the C Set/2 compiler, Toolkit provides the system linker and system header files. It also contains the import libraries and the NMAKE utility you need to dramatically increase the capabilities of C Set/2 to build powerful applications.

To order or get more information on how IBM application development tools can work in your OS/2 environment,

in the USA call 1-800-342-6672

in Canada call 1-800-465-7999

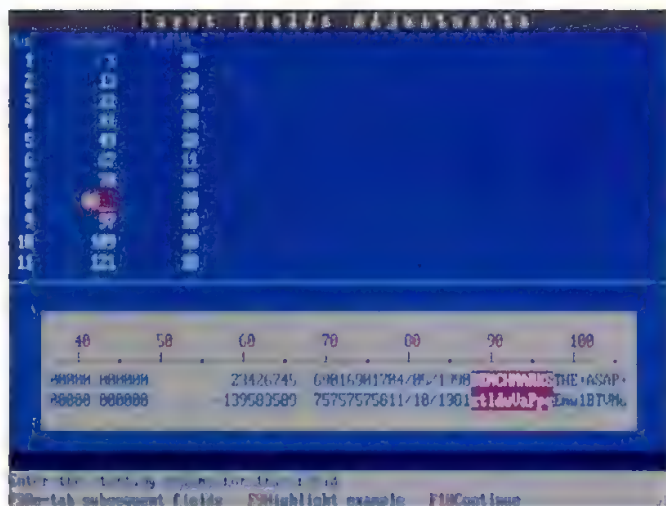
Making good things happen in application development...

IBM®

IBM, OS/2, and Presentation Manager are registered trademarks, C Set/2 and Workframe are trademarks of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation.
CIRCLE 024 ON READER SERVICE CARD

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases



With Alpha Four's import setup preview, as you change start columns and field lengths, the section is highlighted in the record below.

cation-generator feature and a power-scripting facility enable you to create a flexible, customized application quickly. Scripts may consist of a set of sequenced keystrokes, or they may use custom-designed dialog boxes that prompt the user for menu choices or values for script variables.

SOPHISTICATED DATA ACCESS

Alpha Four provides two ways to access data from multiple-file databases. Through *database sets*, Alpha Four lets you link and access up to 15 database ta-

bles at once. When you define a set, graphical representations of the one-to-one or one-to-many links are displayed. You can also include sets within sets, which simplifies the representational view and allows you to look at a complete set of tables instead of a single table.

Multiple-file access can also be achieved through *relational functions*, which allow you to join, intersect, update, or subtract database tables. Relational functions are useful for creating separate tables meeting specified criteria and for batch-posting applications, where it is not desirable to continually keep all the tables open.

Another one of Alpha Four's major strengths is the ease with which you can configure it for network operations. In the Network Settings screen, you choose whether your default mode of file operation is exclusive or shared, and define the time in seconds before automatically updating connected users' screens. Alpha Four provides automatic, transparent record locking behind the scenes to prevent simultaneous changes to the same data. Networking issues are discussed thoroughly in a dedicated chapter of the user's manual. One warning: Users who anticipate the need for multiuser access should purchase the multiuser version, even if at present only a single-user package is needed. The standard multiuser version supports a single user, and add-on packages for three and five users are sold separately. The standalone version, however, cannot be upgraded to support multiple users.

Alpha Four's documentation includes

both a tutorial manual and a detailed reference manual. Technical support is available free of charge and priority corporate support plans are available.

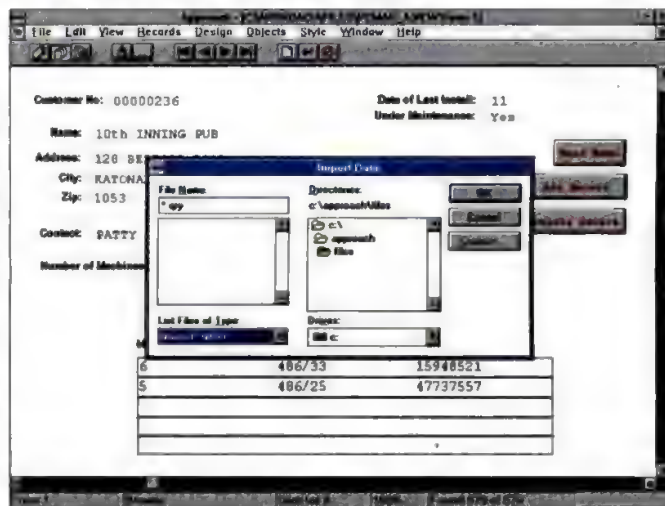
One increasingly common feature that is noticeably absent from Alpha Four is connectivity to SQL database servers such as Oracle or Sybase. Still, Alpha Four is an excellent nonprogrammable database system that has grown to offer almost as much power and flexibility as the more expensive programmable database systems. If you're looking for power and flexibility without the coding hassle, Alpha Four is a choice pick.

Approach Software Corp.

Approach for Windows

BY SHERYL CANTER

The original version of Approach for Windows, released in March 1992, was one of the first nonprogrammable database systems for Windows, and it set a new standard for ease of use. Version 2.0 of Approach (which retails for \$399) was



Approach for Windows can natively access dBASE, FoxPro and Paradox files, and can import a wide array of other formats, as well.

released this past October, at the same time as two brand new nonprogrammable database products for Windows: Claris Corp.'s FileMaker Pro and DataEase International's DataEase Express (both of which are also reviewed in this roundup).

While Approach can no longer lay claim to being the easiest nonprogrammable database, it still offers some ap-



Alpha Four, Version 2.1
Alpha Software Corp., 168 Middlesex
Turnpike, Burlington, MA 01803;
800-451-1018 ext. 117, 617-229-2924

List price: Single-user version, \$495; multiuser version supporting one user, \$549; three-user LAN pack, \$749; five-user LAN pack, \$1,249

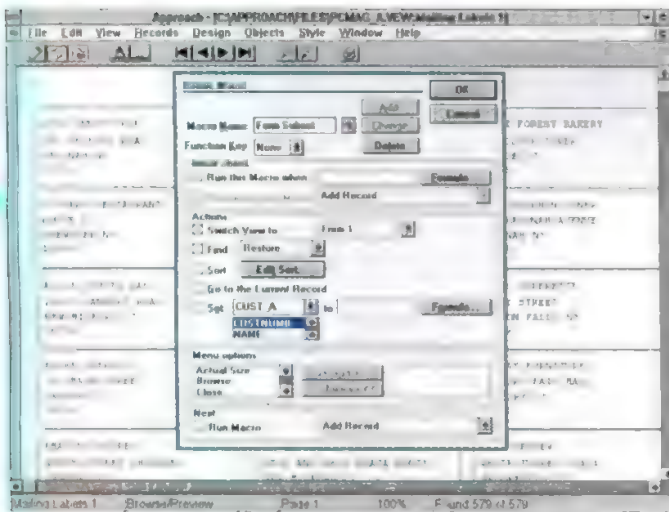
Requires: 640K RAM, 3MB hard disk space, DOS 3.1 or later

In short: A previous Editors' Choice winner, Alpha Four continues to improve in flexibility and features. Its robust relational capabilities and powerful scripting language provide functionality approaching that of the full-fledged (and more expensive) programmable database systems.

ON READER SERVICE CARD

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases



A Find macro in Approach for Windows can be used to print out a subset of database records as mailing labels.

peeling features that cannot be found elsewhere.

One of the best features Approach offers is its direct and speedy access to data in numerous formats. Approach has had native support for dBASE and Paradox file formats from the start; Version 2.0 adds support for FoxPro and facilities for updating native index files (although it

can't create new native index files). It also adds full mail-merge capability and the uncommon ability to import the result set from a SQL database query. Despite these strengths, other advanced features of Approach are less easy to use than they might be. But if you work primarily with single-table databases,

EASY INTERFACE DESIGN

Defining new forms in Approach is exceptionally easy. A toolbar across the top of the screen lets you quickly access interface objects for placement on a form or report. Other toolbar icons let you quickly switch between design mode and run mode to see the results of your work.

When you place a field on a form, the Field Style dialog box appears. This menu provides one-stop shopping for field type (for example, straight text or pick lists) and field display, and a button click will launch the Field Definition menu if needed. Labels can be automatically printed above, below or to either side of the field—or omitted, if you choose. A unique Sample Window within the dialog box shows you how the label/field combo will look with the fonts and settings you've chosen. Default settings can be set and saved for each form, but there is no way to set a project-wide default that will apply to all forms and reports.

Field validation capability is built into the Field Definition menu, which can be launched on its own or from within the Field Style menu. Although you can specify parentheses and dashes for displaying numeric strings such as telephone and social security numbers, the formatting characters don't appear until *after* the number is entered, which can easily mis-

lead users into entering the formatting characters as they type in the data.

Approach is more than just a flat-file system with lookup capabilities; it can perform true table joins. Relationships between tables are specified via a Join menu and are graphically displayed. Some menu-driven options for referential integrity enforcement are built in. You can request cascading deletes, and you can specify that if a new child record is entered a corresponding parent record be created. While you can't enhance either of these options, they are more than many other nonprogrammable databases have to offer.

QUERY LIMITATIONS

Queries (or "Finds") are specified by example; you enter your selection criteria in an empty form. The procedure is easy, but there are limitations. For instance, unlike other packages such as DataEase Express, you can't do selections on summary variables. If you have a customer table in a one-to-many relationship with an order table, you cannot select all customers who ordered more than once.

You have to first compute the number of orders per customer for the entire database, then physically add it to the table. This can be very time-consuming, since there is no way to keep the screen

SUITABILITY TO TASK

Approach for Windows

	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	●	●
Queries	●	●	●	○
Reports	●	●	●	●
Applications development	●	○	○	○

from redrawing after every record.

Finds can be stored as macros. Macros are defined by selecting from a rich list of available functions and menu options; you cannot define macros by recording keystrokes. Find macros are created in a special way: You perform the search manually using a particular form or report, and then create a macro by choosing the menu option to restore the most recent Find. This sounds simple enough, but there are some hidden limitations that are revealed when using the report writer.

An example will illustrate the difficulties. Let's say you have a customer table and an order table in a one-to-many relationship and you want to generate a report in which each page is topped with

FACT FILE

**Approach for Windows,
Version 2.0**

Approach Software Corp., 311 Penobscot
Dr., Redwood City, CA 94063;
800-354-1122, 415-306-7890;
fax, 415-368-5182

List price: \$399, upgrade from Version 1.0, \$39

Requires: 2MB RAM (4MB recommended), 2MB hard disk space (4MB recommended), Windows 3.x.

In short: Approach is an intuitively designed Windows database with full table-join capabilities. It provides native access to dBASE, FoxPro, and Paradox data files and can import data from numerous other formats. It can even import the result set from a query against a SQL database on a remote server. However, some peculiarities in its query functions can make certain tasks awkward. Approach is a good choice if your application requirements don't include reports with fields from multiple files.

500 ON READER SERVICE CARD

CompudyneTM Notebooks. More Of What

We are to
notebooks what
Griselda of Skyland
was to Pomeranians,
the lightest!



• Expansion Station

**ACTUAL SIZE. ONLY 1.5" THICK, 5.5LBS,
INCLUDING BATTERY. NO KIDDING!**

- Full 10", VGA screen with 640 x 480 resolution, 64 grayscale, brilliant LCD and ultra fast 150 MS response time. (No more disappearing mouse pointer!)



- Every Compudyne Notebook comes pre-loaded with MS/DOSTM 5.0, Microsoft[®] WindowsTM 3.1 & Poloris PackRatTM 4.1 Personal Information Manager!

• Fax/Modem

• Memory Modules

• Co-Processor

- Install add-ons in seconds! No more screwdrivers!

- Ultra long-life 24 watt battery pack with 12 AA NiCads.

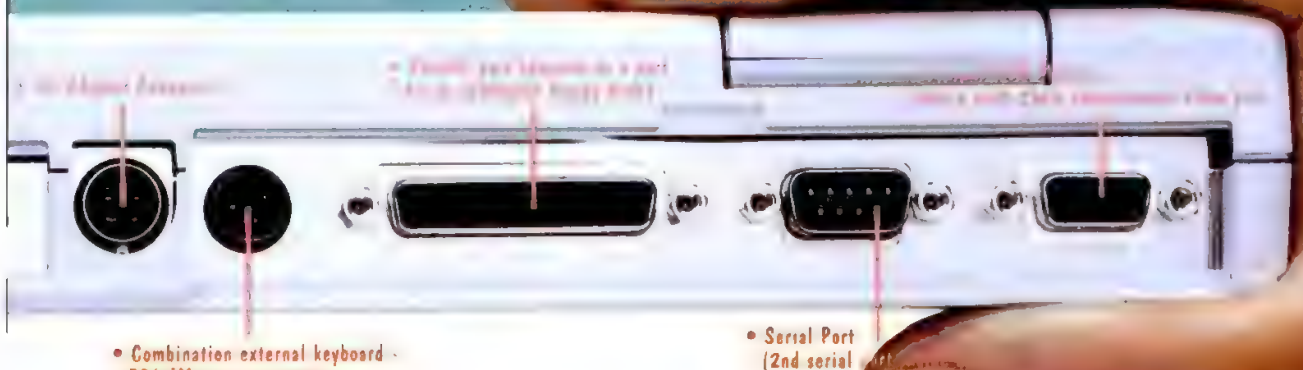
- Stand-by battery on 386 models lets you change batteries without switching off!

• Built-in trackball.

- Internal 3.5", 1.44 MB floppy drive.

- Full size (84/85 key) keyboard with 36 function keys, including dedicated 'Page Up/Down', 'Home' & 'End' keys. A delight for spreadsheets!

You Want. Less of What You Don't.



Compudyne is the PC manufacturing and direct marketing arm of Comp USA™ - The Computer SuperStore (NASDAQ symbol: CUSA) - inventors of big volume, deep discounting PC retailing, and the largest chain of computer super stores in the country.

We manufacture top quality, fully-supported computers as available from only the largest PC manufacturers at prices typically found only at garage shop clone houses.

Result? We're already one of the largest direct PC companies in the country!



OPTIONS:

- Math Co-Processor
- Spare NiCad Battery
- Memory Upgrades:
2 or 4 MB on 386,
4 or 16 MB on 486
- 2400 bps Data Modems with:
4800 bps send-only FAX, or
MNP-5 & 9600 bps send/receive FAX
- External 5.25" Floppy Drive
- External Numeric Keypad
- Expansion Station
- Auto Adapter
- Standard or Leather Carrying Bag

You can also buy these neat products exclusively at

COMPUSA
Computer SuperStore



SUPPORT & WARRANTIES:

- 30-day no questions asked return policy**
- Toll-free telephone technical support
- 1 year limited warranty on parts and labor
- Overnight replacement if needed

ORDERING:

- Order toll-free: **1-800-932-2667**
- Hours of Operation**
7am-10pm (CST) Mon-Fri;
9am-5pm (CST) Sat.
- International callers dial: **1-214-702-0055**
- 24 hour FAX: **1-214-702-0300**
- Ask about corporate credit & volume terms!



PCM0134

DIAL TO SAVE DOLLARS
1-800-932-COMP (2667)



Notebook	CPU	RAM (Mbs)	HD (Mbs)	Battery Life (Hrs)	Price
386SX/20 <i>while supplies last</i>	Intel 80386SX-20 MHz Optional 80387SX Last years' model, 6.5lbs	2 standard 16 max	60	1.5+	\$999 \$37/mo*
386SXL/25 <i>while supplies last</i>	386SXL-25 MHz Optional 80387SX This years' model, 5.5lbs	2 standard 4 & 6 options	60	3.5+	\$1,399 \$52/mo*
386SXL/25	386SXL-25 MHz Optional 80387SX	2 standard 4 & 6 options	80	3.5+	\$1,599 \$59/mo*
386SL/25	Intel 80386SL-25 MHz 64 K CPU cache Advanced SL power mgmt Optional 80387SX co-processor	2 standard 4 & 6 options	80	3.5+	\$1,799 \$67/mo*
486SX/25	Intel 80486SX-25 MHz Built-in 8K CPU cache	4 standard 8 & 20 options	80	2.5+	\$1,999 \$74/mo*
486DX/33	Intel 80486DX-33 MHz Built-in 8K CPU cache	as above	130	2.5+	\$2,899 \$107/mo*



THE LOWEST OF THE LOW PRICES. GUARANTEED.

*Leasing through Leasing Group, Inc. payments based on 36 month open-end rate. **Must be returned "as-new" in the original packaging. ®/® trademarks are the property of their registered owners. †Last years model. Actual photo not shown. Actual weight 6.5lbs Trackball not included. Most specs different from current model. Compudyne Direct, 15151 A Surveyor, Addison TX 75244. Prices and specifications subject to change without notice.

CIRCLE 132 ON READER SERVICE CARD

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases

customer information and is followed by a list of that customer's orders. If you want to print out only those customers living in New York State along with their orders, you're going to run into problems.

The difficulties stem from the product's basic design. In Approach, every report, form, set of mailing labels, or form letter has a "main database." A form showing the information described above would have to designate the customer database as the main database and show the order table in a subform. A report showing the identical information would have to specify the order table as the main database, because the order-table data is the one displayed in the detail band of the report. Customer-table data such as name and address is displayed in a summary band so that it is only shown once for each record. The problem arises because you can only select fields contained in the detail band.

Nor can you use the macro for a Find based on the form version of the report, because the form version uses the customer table as its main database. This brings us to another design limitation: Finds launched via macros will only work on forms and reports that use the same table as their main database. If you try to run a macro based on a different table, you won't get a warning message; it simply won't work.

A call to technical support was necessary to discover that to print a report listing only New York residents, you must create a new, dummy report that places the customer information inside the detail band, then create a Find macro using the dummy report, and finally switch over to the report you want to print and execute the macro.

KEEPING IT SIMPLE

The manuals are well-written and clearly laid out, but thanks to Approach's intuitive design, you won't need the manuals unless you are using the product's more advanced features. On-line help is available, though it is not context-sensitive. Unlimited, free technical support is provided for a toll call, and corporate priority support is available. You can also obtain technical support through CompuServe and through a company-sponsored bulletin board.

If you are planning an application that

uses linked tables and relies heavily on search and reporting capabilities, you will undoubtedly run up against some of the design flaws in the query feature. Although workarounds can be found for most of the difficulties, Approach then loses its ease-of-use advantage. But if your application requirements are modest—and especially if you need to read and manipulate numerous data formats—you'll find Approach to be a flexible and user-friendly tool.

DataEase International Inc.

DataEase Express for Windows

BY SHERYL CANTER

DataEase Express for Windows (\$395), from DataEase International, is a non-programmable database system that includes numerous unusual and welcome features. The powerful relational capabilities of Version 1.0 provide menu-driven referential integrity enforcement. Seven levels of security can be applied to an application's fields and functions; access is assigned at the user level and enforced with passwords. Unfortunately, the product's implementation does not match its excellent design in this first release. The form creation interface is awkward, there is no data import facility, and the package suffers from bugs that range from annoying to show-stopping.

DataEase Express is the company's first Windows product. Forms from the popular, programmable DOS version of the product (DataEase 4.5) can be imported for use within DataEase Express. While many DataEase Query Language (DQL) functions are included, DataEase Express does not contain the full query language capability of the DOS-based version of DataEase.

GREAT DESIGN, AWKWARD IMPLEMENTATION

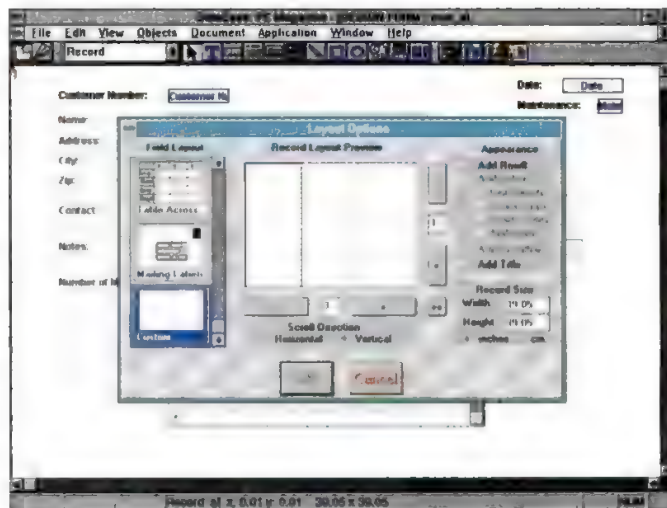
One of the handiest design features of DataEase Express is a general purpose

SUITABILITY TO TASK				
DataEase Express for Windows				
	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	●	●
Queries	●	●	●	○
Reports	●	●	●	○
Applications development	●	●	○	○

layout option that lets you duplicate your form vertically, horizontally, or both. This feature can be used to create standard browse forms, mailing labels, or custom layouts. Although Avery label sizes are not provided as options, the minor inconvenience of entering sizes manually is outweighed by the advantages of this general-purpose implementation.

Once you've chosen the layout, you're ready to design the form. Form design in DataEase Express, though object-oriented, is not as easy as it should be. Placing static text such as field labels on a form is an awkward process. Once you've moved the cursor to the necessary location, it takes three mouse clicks to edit the field. (The first click selects the text block, the second click puts the cursor at the start of the text block, and the third click moves the cursor to where you're pointing.) Also, since the cursor changes to an I-bar after the first click, it's easy to mistakenly think you're in edit mode and accidentally move the field.

Another implementation flaw that can cause you to accidentally move fields



DataEase Express for Windows provides flexible layout options that can be adapted to suit many purposes, such as mailing labels.

Nonprogrammable Databases

is that text blocks aren't outlined in edit mode, and there is no dead space on either side of the text block. If you overshoot by the smallest fraction of an inch when trying to place your cursor at the start or end of the text block, you'll move the field instead of editing it.

Due to a bug, certain sequences of mouse clicks in a form can cause the coordinates for fields and text to slip suddenly into the negative numbers, so part of your form appears to vanish. A call to technical support was necessary to make the missing pieces reappear. DataEase International says they have a fix for this bug in the works.

Form definition can serve double-duty and be used to create both the form and its associated database. When you specify that a particular DataEase Express form "defines the table," any fields you place on that form are created in the database it accesses. If you delete a field from the form, it's deleted from your database. (Changes aren't posted until you save the file, thus minimizing the possibility of an accidental deletion.) On-screen forms also serve double-duty, providing the basis for reports. But get ready to waste some paper; there is no print preview function anywhere in the product.

EFFORTLESS TABLE JOINS

This first version of DataEase Express does not contain an import facility, al-

though one is planned for a future release. Since our benchmark test files were in ASCII format, DataEase International sent us an ASCII import utility that customers can obtain by contacting technical support. Currently, the only nonnative format supported is dBASE (III+ or IV) through Microsoft's ODBC (Open Database Connectivity). Data access through ODBC is very slow, however, and if you want to make any structural changes to the database you must convert it to DataEase format. This is a nonintuitive process, and we had to call technical support for help.

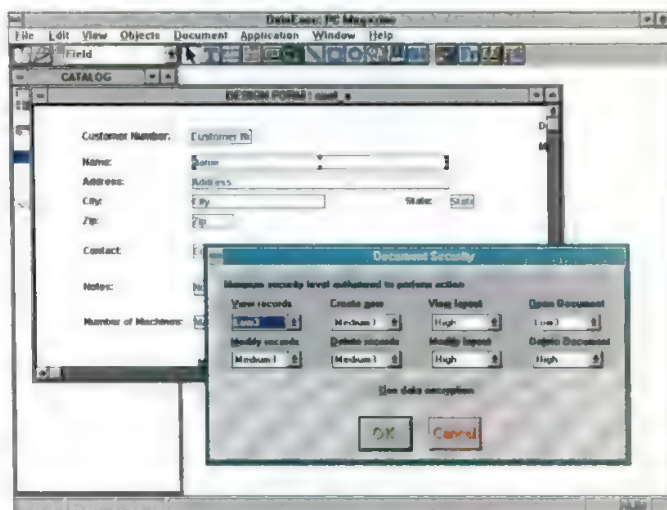
Once you have gotten your data into the package, DataEase Express goes beyond static lookups to provide true table-join capabilities. You can create forms that include child subtables and use compound forms to enter data into multiple tables. Queries can be based on fields from any linked table, with no limitations. Unlike so many of its competitors, there are no problems with searching on summary variables or fields from other tables.

Another example of the package's effortless power is its menu-driven referential integrity enforcement. Relations are defined in a dialog box, where you are given the choice of cascading your deletes to the child table, preventing deletes, or letting the server database handle referential integrity enforcement. There is no way to prevent the entry of orphan records into the child database, but this is a common limitation.

Forms are used for entering criteria for sorts and searches. Here again, the design is good but the implementation leaves something to be desired. For example, if you define a field to display leading zeros, then you must actually type in the leading zeros in order to do a search on that field. DataEase is aware of this problem and says it will be corrected in the next release.

Bugs made our testing experience treacherous. We encountered repeated

Windows GPFs (General Protection Faults) and DataEase project file corruption during our testing of DataEase Express. While many of the crashes seemed to occur at random points, the problems occurred with noticeable regularity when we were deleting tables with relational links.



With DataEase Express for Windows, seven levels of security can be assigned to a broad array of objects and actions within applications.

TRAVERSING THE MAZE

DataEase Express is not a good choice if you need to get your database system up and running quickly. This is partly because of some nonintuitive aspects of the user interface, but mostly it is the fault of the documentation, which is cluttered, poorly organized, and lacking in adequate cross referencing. A sample application, Club ParaDEASE, is included with DataEase Express and is used as a theme throughout the documentation, but its use is often more distracting than illuminating. The on-line help, which is based on the written documentation, suffers from the same problems of poor organization and inadequate cross-referencing.

Overall, the impression DataEase Express leaves is one of deep ambivalence; its feature set and overall design are highly laudable, but its implementation does not meet the same high standard. We wish that the company had waited just a little while longer before releasing the product. There are too many bugs and rough edges in this first release for us to be able to recommend it without serious reservations.

FACT FILE

DataEase Express for Windows, Version 1.0

DataEase International Inc., 7 Cambridge Dr., Trumbull, CT 06611; 800-243-5123, 203-374-8000; fax, 203-365-2317

List price: \$395.

Requires: 2MB RAM, 6MB hard disk space, Microsoft Windows 3.x (4MB RAM, 10MB hard disk space, Windows 3.1 recommended).

In short: DataEase Express shows a lot of promise as a nonprogrammable database entry; its security features and relational capabilities are laudable. Unfortunately, the product suffers from the types of bugs that often plague first releases. Also, this version lacks a data-import utility.

501 ON-READER SERVICE CARD

Claris Corp.

FileMaker Pro 2.0 for Windows

BY JOE SALEMI

FileMaker Pro 2.0 for Windows, the long-awaited Windows version of Claris Corp.'s popular database for the Macintosh platform, raises the standard for ease of use in nonprogrammable databases. This \$399 package makes full use of Microsoft Windows' graphics capabilities, and even offers support for sound under Windows 3.1. A built-in spell-checker helps to ensure accurate text in-

SUITABILITY TO TASK

FileMaker Pro for Windows

	POOR	FAIR	GOOD	EXCELLENT
Database administration	☐	☐	☐	☐
Queries	☐	☐	☐	☐
Reports	☐	☐	☐	☐
Applications development	☐	☐	☐	☐

put. FileMaker Pro's one serious limitation is that it cannot perform true table joins. Multifile capabilities are limited to lookups; data in related tables can be browsed but not modified.

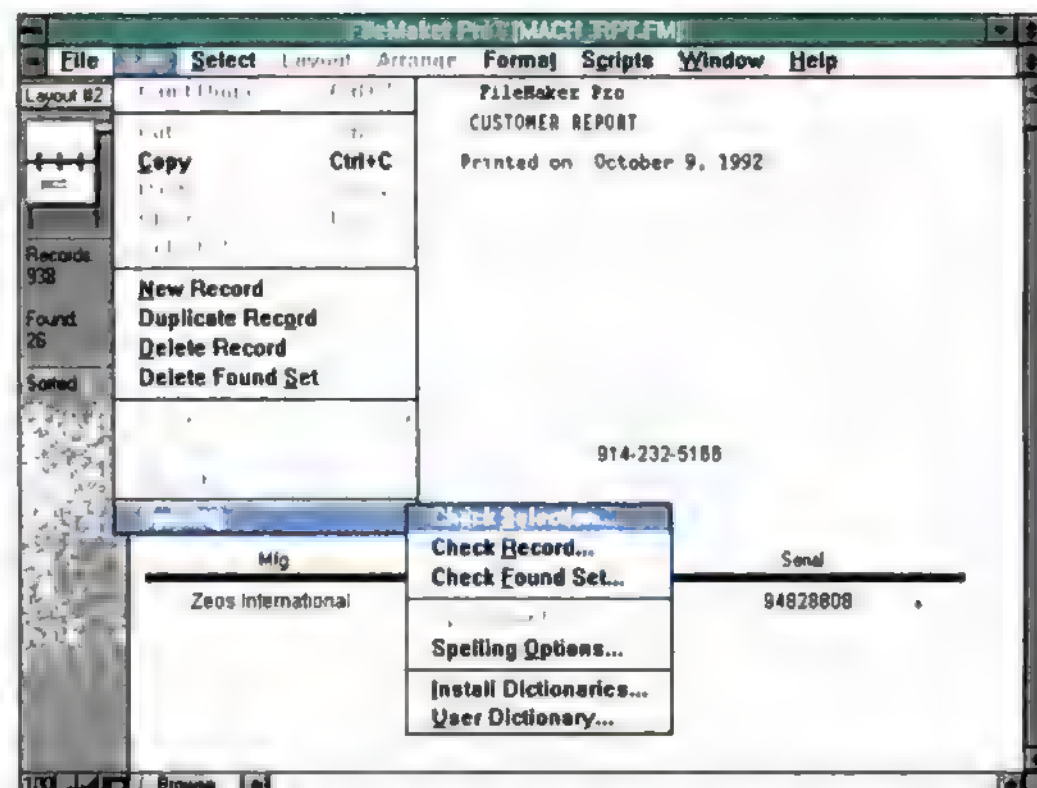
FLAT-FILE, BUT FLEXIBLE

FileMaker Pro 2.0 for Windows is essentially a flat-file database package. Although you can create a field in a form that shows the results of a lookup into

another data file, the "link" isn't dynamic; FileMaker performs the lookup and then copies the data values into the current database. Changes made to the copied data are not reflected in the secondary file, and if the secondary database changes, you have to redo the lookup to bring the primary file into sync. Unless you define a field as a "repeating" field, only the first matching record from the secondary file will be copied into the current database.

The Windows version of FileMaker Pro uses the same file format as the Macintosh version, which makes it ideal for use in mixed-platform environments. However, since the PC version only supports IPX and the Mac version only supports AppleTalk, you will not be able to share these files on the network.

Data can be imported from or exported to comma-delimited ASCII text or BASIC data files, or .DBF, .DIF, .SYLK, or Lotus 1-2-3 files. You can also import or export merge files, such as those used by word processing programs, to create mail-merge files or ASCII text files with each record separated by a tab character.



Its built-in spell-checker makes FileMaker Pro 2.0 for Windows unique among nonprogrammable databases.

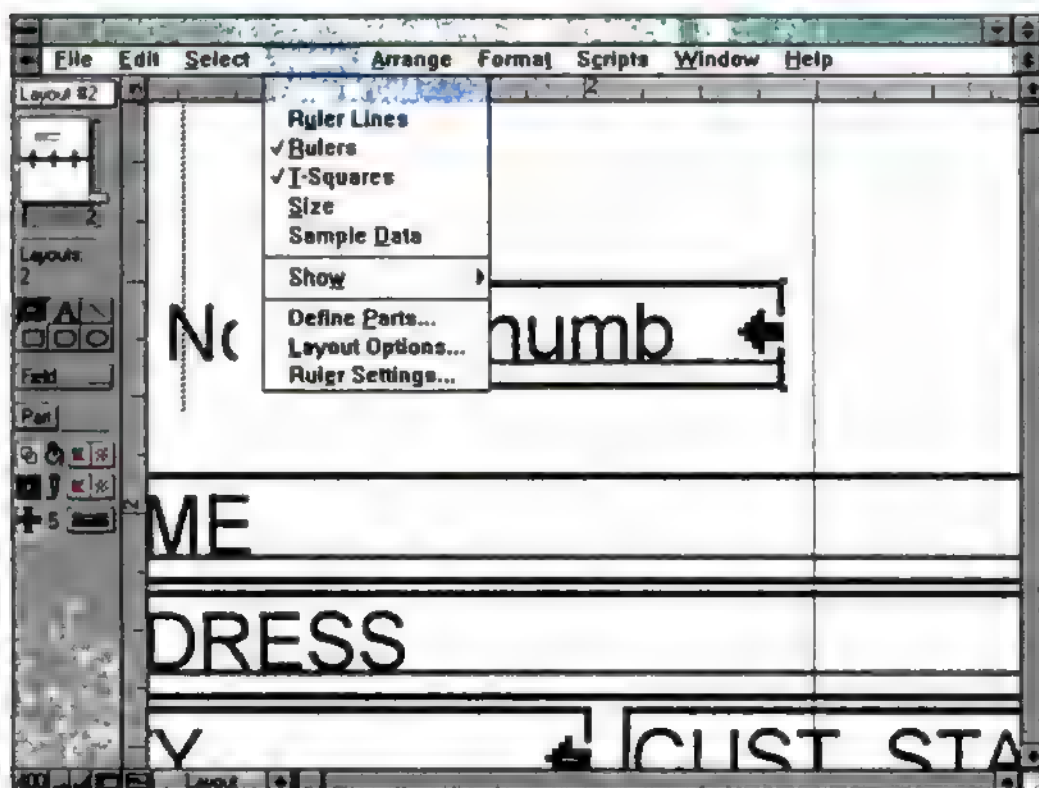
tions control how the data is displayed. The automatic indexing of all fields slows down the data loading process somewhat, but the setup makes for very quick lookups. Forms, or "layouts," are used to create queries. You can have up to 16 database files open at once, but FileMaker Pro's flat-file design prevents you from searching across files.

Each database can have any number of layouts for viewing and printing data. Layouts can be selected from a pick list that is displayed when the layout definition field is active. The package has a number of predefined layout types: standard, columnar, single-page, label, and envelope, among others. Additional layouts are easily created using the full power of the Windows interface. FileMaker Pro gives you on-screen ruler bars, snap-to grids and T-squares to help lay out text and fields; you can magnify the layout to four times normal size to give you precise control over each element's positioning.

AUTOMATIC AUTOMATION

For task automation, FileMaker Pro has an extensive scripting language with over 70 functions. Creating a script in this program is as simple as clicking on actions and functions in a pick list. Scripts can be run from a pop-up or pull-down menu and can be associated with user-designed action buttons where clicking the button runs the script.

Reports and mailing labels are gen-



FileMaker Pro 2.0 for Windows lets users take full advantage of Windows' graphical capabilities when designing layouts.

The package includes built-in networking support for up to 25 users on a Novell NetWare LAN. FileMaker Pro can lock shared files down to the record level and provides group security that can be applied down to the field level.

EASY ACCESS TO DATA

Except for picture fields, sound fields, and calculated fields, all FileMaker Pro data fields are stored as text and are indexed. Formatting op-

fields, sound fields, and calculated fields, all FileMaker Pro data fields are stored as text and are indexed. Formatting op-

Nonprogrammable Databases

PC EDITOR'S CHOICE

FACT FILE

FileMaker Pro 2.0 for Windows

Claris Corp., 5201 Patrick Henry Drive, Box 58168, Santa Clara, CA 95052-8168; 408-727-8227, 800-544-8554 (for upgrades only)

List price: \$399

Requires: 2MB RAM (4MB recommended), 3MB hard disk space, Microsoft Windows 3.x.

In short: FileMaker Pro, which was previously available only for the Macintosh, is now available as a Windows application for the PC. While it does not offer full table-join capabilities, read-only lookups into secondary tables are easily implemented in the program. Its powerful scripting language, shared Macintosh/PC file format, and excellent interface make FileMaker Pro 2.0 for Windows a strong contender in the nonprogrammable database market.

ON READER SERVICE CARD

and excellent use of the Windows graphical interface make FileMaker Pro 2.0 for Windows a strong choice, despite its multifile limitations. Its built-in networking support and ability to directly use the Macintosh version files makes it particularly well-suited for businesses that utilize both platforms.

ButtonWare Inc.

PC-File

BY STEPHEN W. PLAIN

Ten years after its original release as a shareware product, ButtonWare's DOS-based PC-File still provides an inexpensive flat-file database system for users with simple requirements. While not as full-featured as other products in this review, the \$149.95 purchase price of Version 6.5 does buy a reliable product with a few interesting extras.

For instance, PC-File is one of only two products in this roundup that can create charts (AceFile is the other). Horizontal and vertical bar charts, line graphs, pie charts, and scatter plots are easy to produce and can be displayed on-screen or printed in reports. PC-File also includes a telephone dialer and a pop-up calculator. The dialer can automatically dial telephone numbers that are found anywhere in the current record; an ASCII phone log keeps statistics on each call. The calculator can be used anywhere within PC-File and lets you utilize data from fields in the selected record or data from other files.

GRAPHICAL DOS INTERFACE

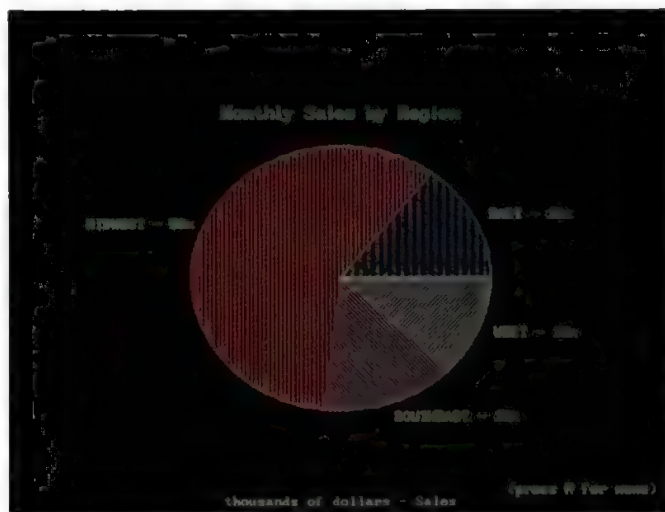
PC-File uses the dBASE III+ file format as its native system, and can import and export files in ASCII .DBF, .DIF, and .WP formats. ASCII files can be fixed-length or comma-delimited.

The DOS-based graphical interface includes mouse support, but the support is unevenly implemented. There are in-

SUITABILITY TO TASK				
PC-File				
	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	○	○
Queries	●	●	○	○
Reports	●	●	○	○
Applications development	N/A			

stances where the absence of an OK button forces you to resort to the keyboard. A configuration option will let you run PC-File in character mode. The menus are identical in the two modes, but this may not be an advantage since it means that the graphical capabilities are not fully exploited. For example, you cannot drag and drop fields into the form using the mouse.

Defining a database with PC-File is quick and easy since it's done while designing the form. Field definition, including field types and entry masks, is done all at once after the fields are created. With the Redefine option, you can later add fields and modify the struc-



PC-File is one of only two packages in this roundup with graphing capabilities. Charts can be viewed on-screen or printed.

erated from layouts and can include headers, summary fields, and footers. FileMaker Pro includes tools for drawing lines, circles, and squares, and you can fill defined areas with different colors to create on-screen highlights. Any graphics element, including picture fields, can be included in printed reports.

FileMaker Pro's most uncommon feature is a built-in spell-checker that can catch spelling errors as you enter data; the spell-checker can also be loaded as a sort of batch process that runs against records currently being browsed. The spell-checker brings up a list of possible spellings when it sees a word that it doesn't recognize, and you can easily add new words to a user's dictionary for future use.

SIMPLE TO USE

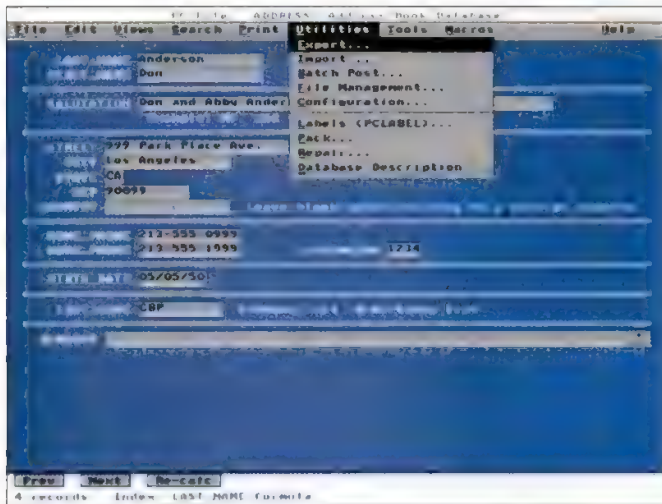
FileMaker Pro uses Windows's built-in help system to provide comprehensive context-sensitive help, and the manuals give step-by-step examples that are helpfully illustrated with screen shots. Claris provides free lifetime phone support as well as support through CompuServe and America Online.

Its built-in spell-checker, respectable performance, flexible data and display features, powerful scripting capabilities,

ture of a database using the same methods with which you originally created the file. Conspicuously absent in the Redefine screen, however, is a Data button for choosing a new field type. Instead, you must place the fields on the screen with the appropriate character and numeric symbols, such as "@" and "#." These symbols are undocumented.

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases



Although a DOS package, PC-File offers a graphical user interface. An option is available to run the program in text mode with the exact same menus.

Although PC-File is a flat-file product, it is possible to access data in other files; there are two methods. If you need to retrieve a value from another database table, you can define a lookup by pointing and clicking your way through dialog boxes to choose the data you desire. Lookups can be used as fields in reports and in form letters.

PC-File also supports batch posting, which lets you add or replace sections of data in one table with data from another table. Posting specifications (instructions that indicate which fields in one table can update fields in other tables) are easily

defined through a dialog box and can be saved. There is also an "unpost" feature, which reverses entirely the last batch posting.

FLEXIBLE REPORT WRITER

Report specifications are stored as ASCII files that contain proprietary database commands. PC-File provides five different types of reports;

for four of these, you need know nothing about the report language. Page reports print each record on a separate page. Row reports generate columnar output. The mailing label option lets you generate simple mailing labels by clicking on the desired fields. The free-form option lets you define a customized, banded report with titles, totals, and footers. The fifth and most powerful option relies on PC-File's report language and lets you directly create or modify the report templates, giving you access to variables, special formatting options, and conditional IF statements within reports. Although these features would be easier to use as part of the free-form report designer, the report language is adequately documented.

A rudimentary word processor is provided for creating mail-merge form letters. Although it does not provide advanced text handling, you can place conditional IF statements within a letter to print different information depending on the data contained in each record. Confusingly, the Tab key is used as a control key; pressing Tab toggles you back and forth between the editing window and the OK button used to close the editing session.

Customized mailing labels can be created, but the utility is inelegantly implemented through a text-based external program launched from the PC-File menu. PC-File can also print bar codes, both by themselves or as bar-coded ZIP codes for envelopes or labels. Of the products reviewed in this story, only Ultra-Plus offers the same capability, and then only as an add-on.

MORE TO COME

By the time you read this, ButtonWare expects to have released Button:File, a Windows-hosted personal organizer. Button:File will replace their TakeNote product, which is an alternative to Microsoft Windows' Cardfile. This is not PC-File for Windows, but rather a flat-file package that implements a card metaphor (similar to the metaphor TakeNote employs). Button:File will provide the ability to create your own card formats, view data in table form, and generate printed reports on your data. Button:File is tentatively priced at \$89.

If you need only the most rudimentary relational capabilities, or if your requirements include charting or bar-code generation, PC-File will do the job, and its modest price tag makes it an attractive choice. But this is not the product to choose for more complex applications.

Scandinavian PC Systems Inc.

PrimaBase

BY JOE SALEMI

Version 3.0 is the first North American release of PrimaBase (\$345.95), from Scandinavian PC Systems. This Windows-based nonprogrammable database system has been available in Scandinavia (under the name Avanti) for more than two years.

PrimaBase has sophisticated multi-file and reporting capabilities, but we found it to also have frustrating limitations and a few minor bugs. It takes poor advantage of the Windows GUI (graphical user interface) and graphics capabilities.

SUITABILITY TO TASK

PrimaBase

	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	●	○
Queries	●	●	●	○
Reports	●	●	○	○
Applications development	●	○	○	○

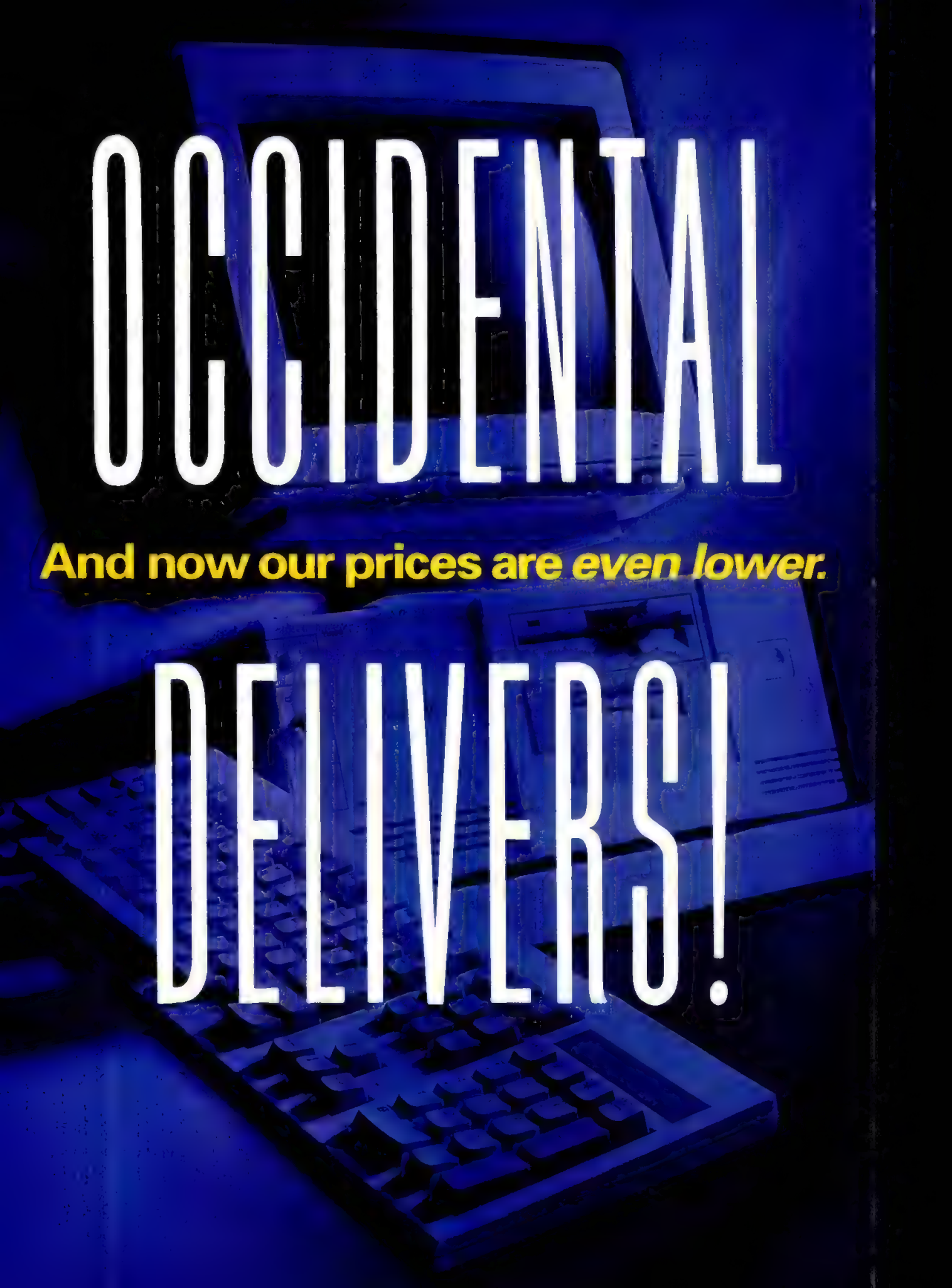
ties, and it is not an easy product to use. The user interface is confusing, and the manuals are poorly translated from the original Swedish. Overall, the problems PrimaBase presents overshadow its capabilities.

FACT FILE

PC-File, Version 6.5
 ButtonWare Inc., P.O. Box 96058, Bellevue, WA 98009; 800-528-8866, 206-454-0479; fax, 206-454-1838

List price: \$149.95.
Requires: 450K RAM, 1.5MB hard disk space, DOS 3.0 or later
In short: After ten years, PC-File remains a reliable and inexpensive choice for flat-file databases. Although it lacks the slick interface and relational capabilities found in the newer nonprogrammable database systems reviewed here, its charting function, auto-dialer, pop-up calculator, and bar-code support are useful and uncommon features

 ON READER SERVICE CARD



OCCIDENTAL

And now our prices are even lower.

DELIVERS!

SAVES!

pricing available
advantage now.



These systems are loaded. Features include a great deal of memory. Large fast hard drives. Both floppies. Local bus video. Local bus expansion. 8 open slots and 6 bays. 1024 x 768 VGA color non-interlaced monitors. DOS, Windows and a mouse. And more. Including toll-free access to our Corporate Support Center. Everyone can take advantage of these corporate volume benefits. Many Occidental systems are pre-built. All are built to corporate quality standards.

They are **ready to ship**. Today. If your firm is on our approved credit list, we process on your Fax PO and ship upon receipt of the original. If you're not on our approved list, getting there is easy. **Just call.** Small and medium size business buyers are welcome too. As are individuals. Leases are available. Major credit cards are accepted. COD is always an option. Custom orders are also welcome.

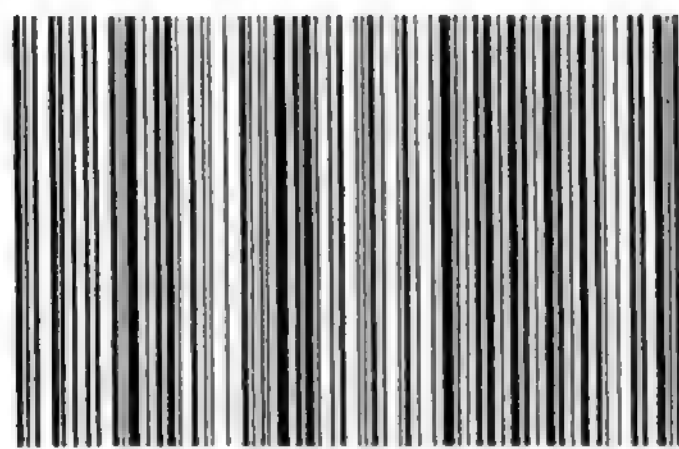
Call 800-
525-6543
for details.

OccidentalSystems.
A DIVISION OF OCCIDENTAL CORPORATION
800-525-6543

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



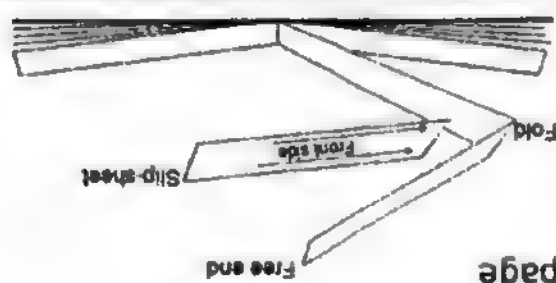
Foldout slip-sheet



Inverted Foldout slip-sheet

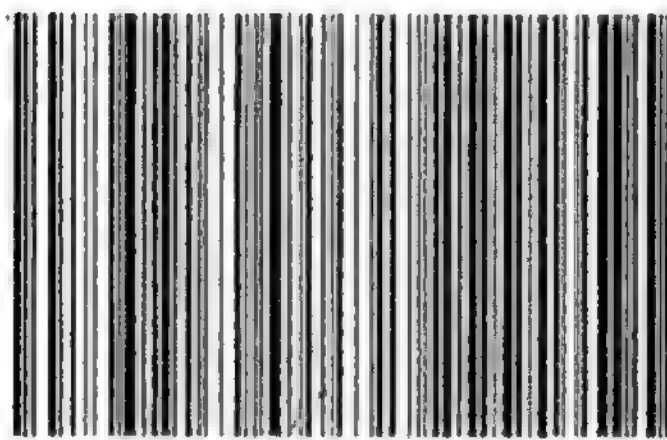
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side

We understand the needs and requirements of corporate computer buyers. Low prices. Top quality. Exceptional performance. Complete compatibility. Prompt delivery. That's what buyers have come to expect from Occidental.[™] And that's what they get. **A no nonsense commitment** to deliver. Systems that work out of the box. Every time. And they keep working. This leads to high volume. Which leads to **low prices**. We are not all things to all people. And we don't want to be. But we may very well be all things to you. Because now you can take advantage of corporate volume buying. Of high performance systems loaded with features at very low prices. Whether you want one or one thousand. **We're happy to help.** If you haven't tried Occidental Systems yet, you should. We are currently building four technologically advanced upgradable platforms featuring Intel's 486SX-25, 486DX-33, 486DX2-50 and 486DX2-66.

EVERYONE

Corporate volume pricing to everyone. Take advantage.

Occidental systems include virtually everything you want. Take advantage of corporate volume pricing and corporate quality standards. Most systems ship the same day.



Loaded Systems. 486DX2-66 \$2595, 486DX2-50 \$2195, 486DX-33 \$1995 & 486SX-25 \$1595

Take a look at these prices and configurations. We think you will agree with Occidental: Build advanced fully featured computer systems and make them available to everyone at volume discount prices. One or one thousand. Everybody saves, including you! Call now, 800-525-6543.

25MHz 486SX: \$1595

The Young Turk. A high performance system package. Works hard. Works fast. Upgradable, it can grow with the job.

- ▶ Intel 80486SX 25MHz Processor
- ▶ Intel Upgrade Zero Insertion Force (ZIF) Socket
- ▶ Upgradable to the future OverDrive™ processor based on Intel's P5 technology
- ▶ 4MB RAM
- ▶ 170MB IDE Hard Drive with 32K Cache
- ▶ Local Bus Video, High Performance VGA with 1MB
- ▶ 14" 1024 x 768 NI VGA Color Monitor
- ▶ 1.2MB 5.25" Drive
- ▶ 1.44MB 3.5" Drive
- ▶ Flash BIOS
- ▶ 8 Open Expansion Slots (7 ISA and 1 Local Bus)
- ▶ Small Footprint Chassis, 6 Drive Bays
- ▶ 1 Parallel and 2 Serial Ports, Integrated
- ▶ TouchType 101-key Tactile Keyboard
- ▶ High-Resolution Mouse
- ▶ MS DOS 5.0, Factory installed
- ▶ MS Windows 3.1, Factory installed
- ▶ Fully compatible. DOS, Novell, Unix, OS/2
- ▶ Ready to run out of the box
- ▶ Same day shipping available*

33MHz 486DX: \$1995

The Executive. Corporate America's #1 choice for all-round computing power.

- ▶ Intel 80486DX 33MHz Processor
- ▶ Intel Upgrade ZIF Socket
- ▶ Upgradable to the future OverDrive™ processor based on Intel's P5 technology
- ▶ 4MB RAM
- ▶ 240MB 12ms IDE Hard Drive with 128K Cache
- ▶ Local Bus Video, High Performance VGA with 1MB
- ▶ 14" 1024 x 768 NI VGA Color Monitor
- ▶ 1.2MB 5.25" Drive
- ▶ 1.44MB 3.5" Drive
- ▶ Flash BIOS
- ▶ 8 Open Expansion Slots (7 ISA and



▶ **Loaded systems. Same day shipping*.**
Low prices. Ready to run out of the box.
Just choose your power platform and call!

1 Local Bus)

- ▶ Small Footprint Chassis, 6 Drive Bays
- ▶ 1 Parallel and 2 Serial Ports, Integrated
- ▶ TouchType 101-key Tactile Keyboard
- ▶ High-Resolution Mouse
- ▶ MS DOS 5.0, Factory installed
- ▶ MS Windows 3.1, Factory installed
- ▶ Fully compatible. DOS, Novell, Unix, OS/2
- ▶ Ready to run out of the box
- ▶ Same day shipping available*

50MHz 486DX2: \$2195

The President. Same configuration as The Executive.

66MHz 486DX2: \$2595

The Chairman. All powerful. The system that handles the most demanding tasks with ease.

- ▶ Intel 80486DX2 66MHz Processor
- ▶ Intel Upgrade ZIF Socket
- ▶ Upgradable to the future OverDrive™ processor based on Intel's P5 technology
- ▶ 128K Cache
- ▶ 8MB RAM
- ▶ 240MB 12ms IDE Hard Drive with 128K Cache
- ▶ Local Bus Video, High Performance VGA with 1MB
- ▶ 14" 1024 x 768 NI VGA Color Monitor
- ▶ 1.2MB 5.25" Drive
- ▶ 1.44MB 3.5" Drive
- ▶ Flash BIOS
- ▶ 8 Open Expansion Slots (7 ISA and 1 Local Bus)
- ▶ Small Footprint Chassis, 6 Drive Bays
- ▶ 1 Parallel and 2 Serial Ports, Integrated
- ▶ TouchType 101-key Tactile Keyboard
- ▶ High-Resolution Mouse
- ▶ MS DOS 5.0, Factory installed
- ▶ MS Windows 3.1, Factory installed
- ▶ Fully compatible. DOS, Novell, Unix, OS/2
- ▶ Ready to run out of the box
- ▶ Same day shipping available*



▶ **Add just \$69 to any desktop system and receive the vertical chassis. Great upgrade. Great price!**

Occidental Service & Support Information:

Occidental Rapid Order Line. For prompt order processing call 800-525-6543.

Occidental Satisfaction Line. A direct line for any questions you may have after your order is placed.

Occidental Artificial Intelligence Line. Our electronic technician answers many questions by fax, in just minutes. 24 hours a day, 7 days a week!

Occidental Bulletin Board Line. On-line BBS for questions, drivers, updates and more.

30-Day Money-Back Guarantee. Toll-Free Technical Support. One year limited warranty. Prompt parts replacement. Optional on-site service plans tailored to your needs.

So why not join buyers nationwide! Put a genuine Occidental system on your desk today. Systems featured here are available for immediate shipment. Custom systems take slightly longer.

Call now toll free:
800-525-6543

Fax 612-486-0019
M-F 7AM-9PM (Central)
Saturday 9AM-1PM (Central)

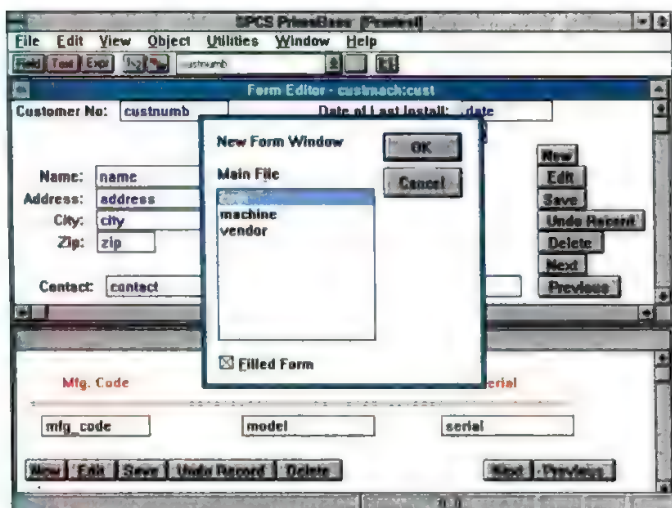
Occidental Systems.
A DIVISION OF OCCIDENTAL CORPORATION

© 1992. *All prices and delivery subject to change without notice, please call to confirm current pricing and availability. All orders subject to payment method approval. Occidental is a trademark of Occidental Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. Occidental Systems is not affiliated with Occidental Petroleum Corp. Occidental Systems, 3771 Lexington Avenue North, St. Paul, Minnesota 55126. 612-486-0020 4PCT-PCM-9212B

Circle 155 on reader service card.

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases



PrimaBase can open up to nine windows within a single form to display matching records from linked files.

UNUSUAL FILE STRUCTURE

PrimaBase's file structure is unusual: What it calls a database is actually a subdirectory with the database's name; the data, index, and control files are all stored in this subdirectory. You can use up to 16 characters in the data file's name, since PrimaBase uses an internal naming scheme and proprietary format when it creates the subdirectory. Calculated fields are computed dynamically and cannot be stored in the database. While this saves some disk space, it slows overall

performance.

PrimaBase requires you to define at least one index before it will save the file definition. Since you can't access the on-line help system at this point, you have to read the manual to figure out why the Save option is non-selectable. You can specify up to 15 indexes per file, with five sorting

levels per index. Like Alpha Software's Alpha Four, PrimaBase requires indexes for sorting data.

PrimaBase imports and exports .DIF and dBASE II, III, and IV text files; it also handles delimited or fixed-format ASCII files. If you want to append data to an existing file, however, the new data must be in ASCII format; .DIF and dBASE files must be imported into new data files. So to append dBASE files, you must first import the file into a new database, export it as an ASCII file, and then import the resultant ASCII file. It's a somewhat cumbersome process.

PrimaBase lets you link files together, though with some limitations.

First, many-to-many links are impossible because the link field in the parent file must have a unique index. The link field in the child file also must be indexed, but the index need not be unique. Also, you can't create links to sets of tables in different subdirectories (in PrimaBase terminology, to files in different databases).

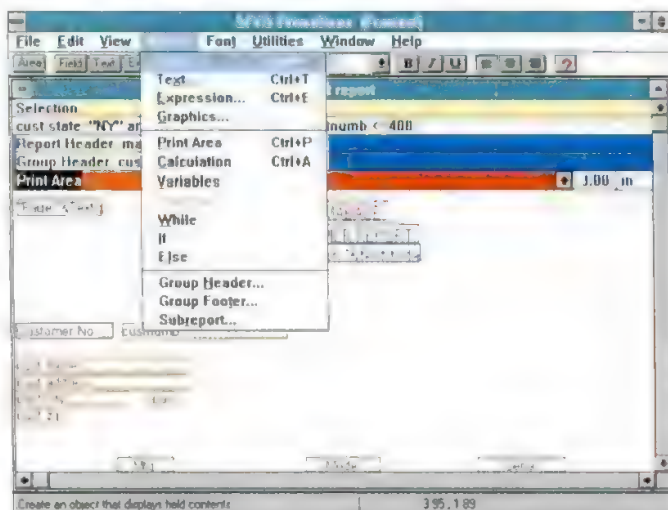
PrimaBase automatically enforces referential integrity by deleting all related records in child files when a record in the parent file is deleted. The program does warn you that it's going to delete all of the child records first, which gives you the opportunity to cancel the action.

You cannot automatically restrict deletes, however.

AN OBJECT-ORIENTED INTERFACE

PrimaBase's interface is organized around object-oriented forms. The package automatically creates a default form for each file and can display the data in table form through the List menu choice. You can create custom forms with options from pull-down menus or the toolbar.

PrimaBase supports two methods of including lookup data on a form. One method is to add a lookup field directly to the form. This approach will let you view only the first matching record in the secondary file. Alternatively, you can create an additional window for paging through the linked records. If you're in the primary window, PrimaBase pages through the main file and shows only the first matching record from the secondary file in the other window. When you are in the secondary window, you can page through all the records in the secondary



PrimaBase has sophisticated reporting capabilities, including WHILE and IF...ELSE options for generating output based on the value of a variable or field.

file, and the record displayed in the primary window changes when the linked field changes. If you want, there is the flexibility to restrict paging in the secondary window to only those records that match the primary record.

PrimaBase can't include graphic images in a form—not even through DDE—and its line-drawing function merely lets you create a titled box around other objects. There are no macro or

FACT FILE

PrimaBase, Version 3.0

Scandinavian PC Systems Inc., PO Box 3156, Baton Rouge, LA 70821-3156; 800-487-7727, 504-338-9580; fax, 504-338-9670

List price: \$349.95

Requires: 2MB RAM, 2MB hard disk space, Microsoft Windows 3.x

In short: PrimaBase is a Windows database with sophisticated multiform and reporting features,

but it does not take good advantage of Windows' graphical capabilities. The interface is less straightforward than those in other Windows database packages, and the documentation is poorly translated from the original Swedish. Unfortunately, PrimaBase's limitations far overshadow its sophisticated multiform and reporting capabilities.

504 ON-READER SERVICE CARD

APPLICATIONS DEVELOPMENT
Nonprogrammable Databases

► **S U M M A R Y O F F E A T U R E S**

Nonprogrammable Databases

Products listed in alphabetical order

■ = YES □ = NO

	PC EDITOR'S CHOICE		PC EDITOR'S CHOICE		
	AceFile for Windows	Alpha Four	Approach for Windows	DataEase Express for Windows	FileMaker Pro for Windows
List price	\$199.00	\$495.00	\$399.00	\$395.00	\$399.00
Operating environment	Windows	DOS	Windows	Windows	Windows
Number of users supported by base package	1	1	1	1	20
Multuser version available	■	■	□	□	■
File Structure					
Type of multifile access	Joins	Joins	Joins	Joins	Lookups
Maximum number of characters per field	254	254	255	255	65,536
Maximum number of fields per record	254	128	255	255	32MB
Maximum record size	4K	4K	4K	4K	Info not available
Maximum size of data file	1 billion records	2 billion records	2 billion records	16 million records	32MB
File Formats					
Native filing systems:					
dBASE III	■	■	□	□	□
dBASE IV	□	■	■	□	□
Proprietary	□	□	□	■	■
Other	None	None	FoxPro, Paradox	None	None
Import/export formats:					
ASCII (delimited)	■	■	■	□	■
ASCII (fixed-length)	■	■	□	□	■
dBASE II	□	■	□	□	□
dBASE III/III+	■	■	■	■	■
dBASE IV	■	□	■	■	□
.DIF	□	■	□	□	■
Lotus 1-2-3 (.WKS or .WK1)	■	■	■	□	■
Microsoft Excel (.XLS)	□	□	■	□	□
Microsoft Word (.DOC)	□	□	□	□	□
Paradox (.DB)	□	□	■	□	□
.PFS	□	■	□	□	□
WordPerfect (.WP)	□	■	□	□	□
Other	Symphony (.WR1)	Multiplan	DB2, Oracle, Query (.QRY), SQL Server	None	BASIC, FileMaker Pro, SYLK, WordStar Merge
Field Attributes					
Data types allowed:					
Boolean	■	■	■	□	□
Calculated	■	■	■	■	■
Currency	□	□	■	■	□
Date	■	■	■	■	■
Fixed-length character	■	■	■	■	□
Integer	■	□	■	■	■
Memo fields	■	■	■	■	■
Rich data types (pictures, sound)	■	□	■	■	■
Time	□	□	■	■	■

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases

PC-File	PrimaBase	PRO-dVelBase	Q&A	Ultra-Plus
\$149.95	\$349.95	\$250.00	\$399.00	\$395.00
DOS	Windows	DOS	DOS	DOS
1	1	1	1	1
☐	☒	☒	☒	☐

Lookups	Joins	Joins	Lookups	Lookups
254	400	128	32,767	15 million
128	200	254	2,045	60,000
4,000 characters	16,000 characters	1,600 characters	63K	15 million characters
1 billion records	Unlimited	1 billion records	16 million records	Unlimited

☒	☐	☒	☐	☐
☐	☐	☒	☐	☐
☐	☒	☐	☒	☒
None	None	None	None	None
☒	☒	☐	☒	☒
☒	☒	☐	☒	☒
☐	☒	☐	☒	☒
☒	☒	☒	☒	☒
☐	☒	☒	☒	☒
☒	☒	☐	☒	☒
☐	☐	☐	(import only)	☐
☐	☐	☐	☐	☐
☐	☐	☐	☒	☐
☐	☐	☐	☒	☐
☐	☐	☐	☒	☐
☒	☐	☐	(export only)	☐
None	None	None	DCA, IBM Filing Assistant (import), MultiMate, PFS (import), ProWrite, Symphony (import), WordStar	FileMaker, Merge, Nutshell, WordStar Merge

☒	☐	☐	☒	☒
☒	☒	☐	☒	☒
☐	☐	☐	☒	☐
☒	☒	☒	☒	☒
☒	☒	☒	☐	☒
☐	☒	☒	☐	☒
☒	☐	☒	☒	☒
☐	☐	☐	☐	☐
☐	☒	☒	☒	☒

CONTINUES

scripting capabilities offered in PrimaBase, but you can place one of 17 pre-defined action buttons (such as Delete or Search) on a form. You can also use built-in functions such as sum, minimum, and maximum in expressions for data manipulation or analysis.

QUERY FACILITIES

Queries are done through a form, but you can only search for data that exactly matches the criteria or that matches the criteria with wildcards. PrimaBase doesn't allow you to use an expression as a criterion, which makes logical searches impossible.

No such query limitations exist when creating reports; PrimaBase lets you use built-in logical or string functions to create the search criteria. The search criteria are entered into the selection block and stored with the report for future modification or use.

Like the primary interface, the report designer is object-oriented and has the same line- and box-drawing capabilities of the primary interface. It supports multiple report levels including groups and subreports. Each block can contain expressions, static text, and fields from primary and linked files. You can also create calculation blocks, which can be used to globally update or delete records in the database. The blocks can also be used to create DDE (Dynamic Data Exchange) links with other Windows applications. But PrimaBase can only act as a DDE server; you cannot link to graphics or data from other applications. You can even create WHILE or IF...ELSE blocks that control which portions of the report are printed based on the value in a field or variable.

A ROUGH TRANSLATION

While the manuals contain everything you need to know to use PrimaBase, they are poorly organized, and portions are poorly translated from the original Swedish to English. Some of the sentence structures are so confusing that you may find yourself rereading a paragraph several times before you can decipher the meaning. We also found a few bugs in the on-line help system. For example, clicking on the help button in some of the dialog boxes did absolutely nothing; in other instances it brought up help screens for

APPLICATIONS DEVELOPMENT
Nonprogrammable Databases

► **S U M M A R Y O F F E A T U R E S**

Products listed in alphabetical order						
■ = YES □ = NO						
	AceFile for Windows	Alpha Four	Approach for Windows	DataEase Express for Windows	FileMaker Pro for Windows	
Field Attributes (continued)						
Automatically generated values:						
Default values	■	■	■	■	■	
Automatically incrementing fields	□	■	■	■	■	
Validation tests:						
Range testing	■	■	■	■	■	
Pattern testing	□	■	■	■	■	
Double-entry verification	□	■	□	□	□	
Unique fields	■	■	■	■	■	
Indexing:						
Can enforce unique values	■	■	■	■	■	
Can index on compound fields	■	■	□	■	□	
User can turn index on and off	■	■	■	■	□	
User can respecify indexed fields	■	■	■	■	N/A	
Searching and Sorting						
Search parameters:						
Case-sensitive searches	■	■	□	□	□	
Nonindexed fields	□	■	■	■	N/A	
Phonetic searches	□	■	□	□	□	
Range searches	■	■	■	■	■	
Substring searches	■	■	□	□	■	
Wildcard searches	■	■	□	□	■	
Summary values	■	□	□	■	■	
Query interface:						
Command line	□	□	□	□	□	
Menus	■	■	□	□	■	
Query by form	□	□	■	■	■	
Query by example	□	□	□	□	□	
Stored queries	■	■	□	□	□	
Sorting:						
Descending sort	■	■	■	■	■	
Can sort on compound fields	■	■	□	■	■	
Can sort on nonindexed fields	□	■	■	■	N/A	
Maximum number of sorting levels	3	Unlimited	255	Unlimited	10	
Can customize collating sequence	□	■	□	■	■	
Update Facilities						
Multiple file updates	□	■	■	■	□	
Multiple record updates	□	■	■	□	■	
Global updates	■	■	■	□	■	
Batch posting	■	■	□	□	□	
Advanced Features						
Macro or scripting language	■	■	■	□	■	
Can record and play back keystrokes	■	■	□	□	□	
Cross-tabular reports	■	■	□	□	□	
Charting capability	■	□	□	□	□	
Can carry over value from previous record	■	■	■	□	■	
Variable-length mail-merge	■	■	■	□	□	
Mailing labels	■	■	■	■	■	
Application generator	□	■	□	□	□	

N/A—Not applicable. The package automatically indexes all fields in the process of loading tables.

APPLICATIONS DEVELOPMENT
Nonprogrammable Databases

PC-File	PrimaBase	PRO-dVelBase	Q&A	Ultra-Plus
☒	☒	☒	☒	☒
☒	☒	☒	☒	☒
☐	☒	☒	☒	☒
☒	☐	☒	☒	☐
☐	☐	☐	☐	☐
☒	☒	☒	☒	☒
☐	☒	☒	☒	☒
☐	☐	☐	☐	☐
☐	☒	☐	☐	☐
☒	☒	☒	☒	N/A
☒	☐	☒	☒	☐
☒	☒	☐	☒	N/A
☒	☐	☐	☒	☐
☒	☐	☐	☒	☒
☒	☒	☐	☒	☒
☒	☐	☐	☒	☐
☒	☐	☐	☒	☐
☐	☒	☐	☒	☒
☐	☒	☒	☒	☒
☒	☐	☐	☒	N/A
Varies	5	10	50	Unlimited
☐	☐	☐	☒	☐
☐	☒	☒	☐	☒
☐	☒	☒	☐	☐
☒	☒	☒	☒	☐
☒	☐	☒	☒	☐
☒	☐	☐	☒	☐
☒	☐	☒	☒	☒
☒	☐	☒	☒	☒
☒	☒	☒	☒	☒
☐	☐	☒	☒	☐

ENDS

the wrong function. To its credit, Scandinavian PC Systems provides free life-time support through both a technical support line and a fax service.

Unfortunately, PrimaBase's limitations far overshadow its sophisticated multifile and reporting capabilities. The system's inability to do logical searches, limited use of Windows' GUI capabilities, and confusing interface make it a poor buy when compared to other non-programmable database packages in the same price range.

Accelerated Software Corp.

PRO-dVelBase

BY WILLIAM BEEM

Accelerated Software Corp.'s PRO-dVelBase, Version 2.0, is a rather unremarkable product. The combination of a confusing interface, cryptic error messages, and limited file linkage and import facilities makes the DOS-based PRO-dVelBase a classic case study of poor program design.

The convoluted user interface is loosely based on a set of objects, such as forms, queries, reports, or labels. Before any of these objects can be used, they must first be created, selected, and then executed. A work area on the bottom half of the screen shows which objects are selected and available for use.

Actions you perform on objects become objects themselves. For instance, appending data to a form is an object. This metaphor can become confusing. In order to append data to a target form, it must not be selected. Instead, the source database is selected, and the Append object exports data from it to a target database.

With the exception of the .DBF file format that PRO-dVelBase uses, no facility exists for importing data from any source. If you need to import spreadsheet

SUITABILITY TO TASK				
PRO-dVelBase				
	POOR	FAIR	GOOD	EXCELLENT
Database administration	☒	☐	☐	☐
Queries	☒	☒	☐	☐
Reports	☒	☒	☐	☐
Applications development	N/A			

Now! From 6 Lbs. To 60 GBs, Northgate®

Northgate announces the most complete range of local bus solutions plus the industry's most advanced disk array technology.

Lightweight notebooks...space-saving workstations...fast, efficient file servers and disk arrays. No matter what your work-group demands, Northgate delivers cutting-edge solutions at some of the best prices in the industry.



Northgate® ZXPortable™

- Intel® 486SX/25MHz processor
- 120MB 2.5" hard drive
- 4MB RAM; expands to 16MB with 4MB or 8MB memory cards
- Clear 640 x 480 VGA monochrome display with 64 shades of gray OR 640 x 480 Active Matrix Color display with 512K video memory and 256 simultaneous colors
- 86-key full-travel keyboard
- Nickel metal-hydrate battery
- True 8.5" x 11" size; monochrome weighs 6.2 lbs.; color 6.4 lbs.
- MS-DOS 5.0 & Windows™ 3.1
- Trackball mouse
- Optional Docking Station allows integration into network environment

Monochrome ZXPortable\$1999
(Lease as low as \$73.96/mo.)*

Color ZXPortable....\$3799
(Lease as low as \$129.93/mo.)*

Docking Station\$599

Look...Six Northgate Local Bus Systems!



Elegance 486 ZXP ISA-V Space-Saver

- 80486SX/25 processor
- Upgradable to i486™ processors and OverDrives; supports P24-T
- Two bus-master VESA local bus slots
- 64K cache; expands to 256K
- 4MB RAM; expands to 64MB
- 100MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor with 1MB local bus video card
- Northgate 101-S keyboard

\$1699
(Lease as low as \$62.86/mo.)*

Elegance 486 ZXP EISA-V Space-Saver

- 80486/33 processor
- Upgradable to i486 processors and OverDrives; supports P24-T
- Two bus-master VESA local bus slots
- Six 32-bit EISA bus master slots
- 128K adaptive write-back cache; expands to 256K
- 4MB RAM; expands to 128MB
- 100MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor with 1MB local bus video card
- Northgate 101-S keyboard

\$2599
(Lease as low as \$88.89/mo.)*



Elegance 486 ZXP ISA-V Desktop

- 80486/33 processor
- Upgradable to i486 processors and OverDrives; supports P24-T
- Two bus-master VESA local bus slots
- 64K cache; expands to 256K
- 4MB RAM; expands to 64MB
- 100MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor with 1MB local bus video card
- Northgate 101-S keyboard

\$2199
(Lease as low as \$81.36/mo.)*

Elegance 486 ZXP EISA-V Desktop

- 80486DX2/50 processor
- Upgradable to i486 processors and OverDrives; supports P24-T
- Two bus-master VESA local bus slots
- Six 32-bit EISA bus master slots
- 128K adaptive write-back cache; expands to 256K
- 4MB RAM; expands to 128MB
- 200MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor with 1MB local bus video card
- Northgate 101-S keyboard

\$3199
(Lease as low as \$109.41/mo.)*



Elegance 486 ZXP ISA-V Tower

- 80486DX2/66 processor
- Upgradable to i486 processors and OverDrives; supports P24-T
- Two bus-master VESA local bus slots
- 64K cache; expands to 256K
- 4MB RAM; expands to 64MB
- 200MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor with 1MB local bus video card
- Northgate 101-S keyboard

\$2949
(Lease as low as \$100.86/mo.)*

SlimLine 486 ZXP-L (not pictured)

- 80486SX/25 processor
- Upgradable to i486 processors and OverDrives
- 1MB local bus video
- Virtual cache
- 4MB RAM; expands to 128MB
- 100MB hard drive
- 1.2MB or 1.44MB floppy drive
- 14" SVGA color monitor
- Northgate 101-S keyboard

\$1499
(Lease as low as \$55.46/mo.)*

**Made in
U.S.A.**

Makes Workgroup Solutions Affordable.



Elegance 486 ZXP EISA Server

- 80486DX2/66 processor
- Upgradable to i486 processors and OverDrives
- Six 32-bit EISA bus master slots
- 128K write-back cache expands to 256K
- 4MB RAM; expands to 64MB
- 200MB hard drive
- Jumbo 8-bay Tower case
- 300 watt power supply; 450 watt also available
- 1.2MB or 1.44MB floppy drive
- 14" VGA monochrome monitor
- Northgate 101-S keyboard

\$3099

(Lease as low as \$105.99/mo.)*

Northgate Backs Every System With Expert Service And Support.

- 30-day money back guarantee.
- 1-year parts and labor warranty; 5 years on selected disk arrays and file servers.
- Toll-free technical support 24 hours a day, seven days a week.
- On-site service provided by NCR.®



Northgate Internal Disk Array

- 486/33 EISA motherboard with 16MB RAM
- Internal disk array with up to ten 3.5" drives
- Single SCSI-2 channel; expandable to 2, 3 and 5 channels
- EISA bus master with 33MB burst mode transfers
- 16MB cache; expands 64MB
- 400MB base storage; expands to 10GB
- RAID levels 0, 1 and 5
- Hot-sparing and background data rebuild for zero downtime
- Three independent power supplies with redundancy
- 14" VGA monochrome monitor
- Northgate 101-S keyboard
- Novell® certified device drivers and utilities for NetWare™ 3.11
- Vertical case
- Five year limited warranty

\$6999

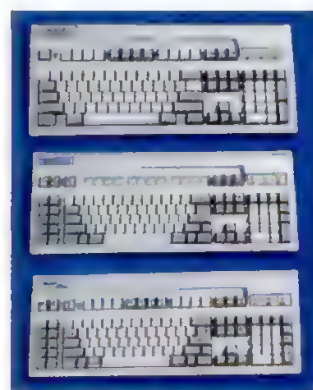
(Lease as low as \$233.07/mo.)*

Northgate External Disk Array

- External disk array with up to five drives per chassis
- 400MB base storage; 60GB maximum with 5 channel array
- Single SCSI-2 channel; expandable to 2, 3 and 5 channels
- EISA bus master with 33MB burst mode transfers
- 16MB cache; expands to 64MB
- 400MB fault-tolerant storage
- RAID levels 0, 1 and 5
- i960-based RAID controller and cabling to connect the array to the server
- Hot-sparing and background data rebuild for zero downtime
- Five independent power supplies
- Novell certified device drivers and utilities for NetWare™ 3.11
- Vertical case
- Five year limited warranty

\$4299

(Lease as low as \$147.03/mo.)*



Genuine Northgate OmniKey® Keyboards

- Choose 101NI with 12 F-keys on top; 102 with 12 F-keys on left or ULTRA with 12 F-keys on top and left
- Alps click/tactile key switches
- Independent inverted "T" cursor control and numeric keypads
- Period/comma lock key locks out () even when shifted
- Rate select from 3-120 CPS
- Interchangeable CTRL, ALT, CAPS LOCK keys
- Unmatched IBM® compatibility
- FCC Class B certified



OmniKey/101NI\$89

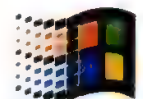
OmniKey/102\$89

OmniKey/ULTRA\$129

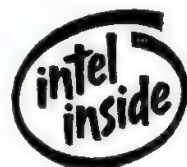
Call For More Information 800-453-0112

GSA #GS00K91AGS5193 PS01

Major credit cards, money orders, direct wire and approved company purchase orders accepted.



MICROSOFT®
WINDOWS™
READY-TO-RUN

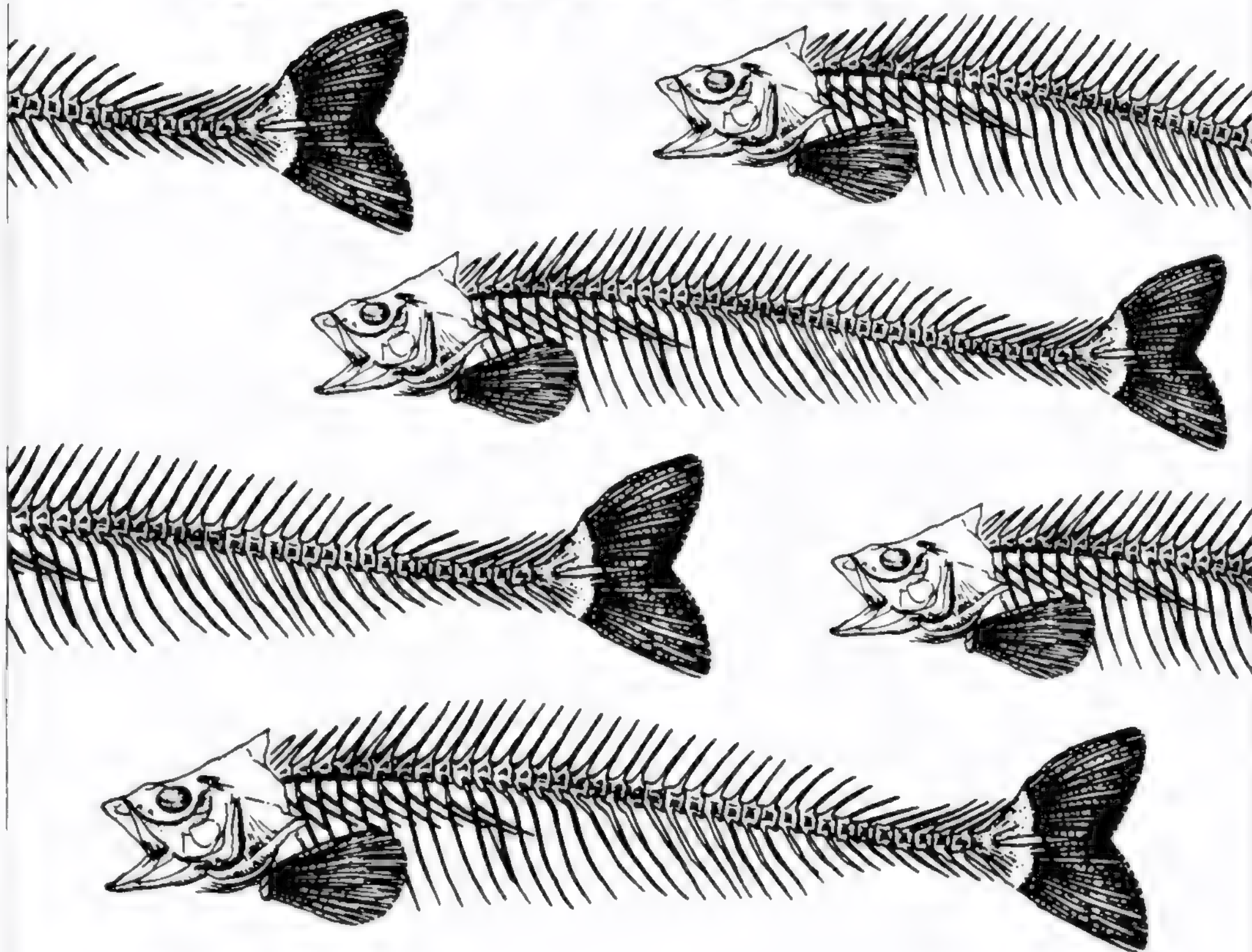


NORTHGATE
COMPUTER
SYSTEMS, INC.

"Solutions for Workgroups"™

7075 Flying Cloud Drive, Eden Prairie, MN 55344

Let's not pollute our ocean of air like we polluted theirs.



We live in an ocean of air.

Poison it with cigarette smoke and air pollution and it can take away the lives it was meant to sustain.

The American Lung Association fights environmentally caused diseases of the lungs. Only with your help can we stem the tide.

It's a matter of life and breath.[®]

Space contributed by the publisher as a public service.

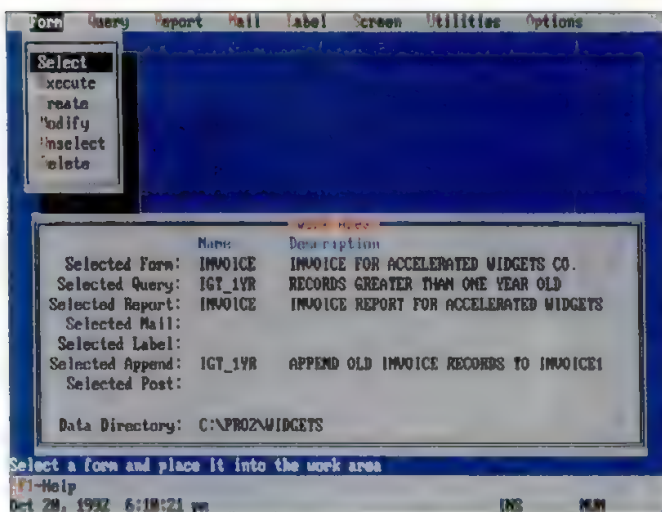
 **AMERICAN
LUNG
ASSOCIATION[®]**
The Christmas Seal People[®]

or ASCII files, you will have to use another program or utility to convert them into .DBF format, or rekey the information.

Creating a data file in PRO-dVelBase is a cumbersome procedure that involves defining a data entry form. Fields and labels are positioned on the screen during the file definition. In addition to the typical queries about data type and length, PRO-dVelBase also uses this step to define indexes and entry-screen behavior. Help messages, unique or mandatory field requirements, and data entry picture masks are defined for each field in the form-creation process. For existing .DBF files, the program will create a standard entry form using field names for the screen prompts.

A LIMITED REPORT WRITER

Defining a report is much like creating a data entry form. PRO-dVelBase allows database, calculated, and system fields to be positioned on the report. System fields include items such as date, time, and page number.



A pull-down menu option in the PRO-dVelBase system displays the status of selected objects in the work area.

Reports can be divided into up to five group expressions. Unfortunately, calculated fields are not allowed in these expressions—another example of poor design. Why provide a useful tool like calculated fields, and then prevent it from

being used in a logical place, such as a group expression?

Printer support is supplied for most major brands of printers, but that support is limited to escape-code sequences to toggle features on and off. A printer-definition screen is provided to add support for new printers or change the behavior of the supplied drivers. There is no support for including graphics or additional fonts not supplied with the printer.

PRO-dVelBase has a decent query-by-example facility. Either complete or partial logical expressions are supported. Pick lists supply all of the available functions and operators to build your queries, and queries can be sorted on up to ten fields. The queries can also be used as a filter for subsequent reports or labels.

ONE-TO-MANY DESIGN FLAWS

Multiple-file entry forms are possible, including one-to-many relationships. Unfortunately, only 20 records are allowed on the "many" side of the relation. Imagine having a limitation like this on an order-entry system. After the first 20

FACT FILE

PRO-dVelBase, Version 2.0
Accelerated Software Corp., 15910 112A St.,
Edmonton, Alberta, Canada T5K 1J6;
403-456-9163; fax 403-457-3582

List price: \$250, LAN version, \$295, shareware version (available as PRO-dVelBase Lite), \$79.95

Requires: 640K RAM, 2MB hard disk space, DOS 3.0 or later

In short: Accelerated Software's nonprogrammable database offering suffers from numerous design flaws. PRO-dVelBase lacks file import/export facilities and ignores data integrity in allowing records to be saved even if mandatory fields are not filled. We find it impossible to recommend PRO-dVelBase.

 **95** ON READER SERVICE CARD

PS/2 Processor Upgrades...

- 486 upgrades for Models 70 & 80
- 386 upgrades for Models 50, 50z & 60

33 MHz Speed! Zero Slot Solution!

Call 800-446-4525 today for details!

Σ Sigma Data
THE UPGRADE SPECIALISTS

P.O. BOX 1790, NEW LONDON, NEW HAMPSHIRE 03257 FAX 603-526-6915

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases

Invoice for Accelerated Widgets Co.

Customer Information:
 Cust # [] Surname [] First Name [] Sex [] Phone Number []
 Address [] City [] State [] Zip Code []

Invoice Information:
 Invoice Number [] Sales Date [mm/dd/yyyy]

Item #	Item Name	Quantity	In Stk	Unit Price	Extended Price
[]	[]	[]	[]	[]	0.00

Sub Total: 0.00
 Amount of Tax: 0.00
 Grand Total: 0.00

Attn: CUSTOMER-POUR NO. Mfr: INVNO-POUR NO. Ser: INV/IB
 ENTER THE CUSTOMER NUMBER OR PRESS F5 TO ENTER NEW CUSTOMER NUMBER

Help Table Copy Field Search Save Abort
 Oct 29, 1992 6:00:49 pm Screen: 1 Recall: F5/AB INS NUM

This PRO-dVelBase form includes fields from both a customer table and an invoice table, which are joined in a one-to-many relationship.

items, other purchases would be ignored!

Another design flaw in PRO-dVelBase limits the links to only character fields. The common practice of linking files based on numeric or date values is precluded.

Finally, all of the records in a one-to-many relationship are loaded into memory. Although PRO-dVelBase specifies a generous limit of 1 billion records per file, working relationships will be limited to the amount of available RAM in your machine.

But not only does PRO-dVelBase suffer from multiple design flaws, it is also unstable. Some bugs are trapped by the program and result in error messages rather than system crashes. The message "INTERNAL ERROR 200" appeared repeatedly during testing. A quick check of error-message descriptions in the reference manual stated that this indicated an unresolvable error and that Accelerated Software should be contacted with the details.

Not all internal program errors are successfully trapped. The program locked up while reindexing a supplied sample data file.

ADEQUATE DOCUMENTATION, BUT...

Two spiral-bound manuals—a reference and a tutorial—accompany the PRO-dVelBase package. Although the tutorial contains numerous lapses in grammar, it does manage to lead you through the important parts of an application, in-

cluding menu screens and multi-file queries and reports. Numerous screen shots accompany each section in the tutorial.

The manual begins with an introduction of PRO-dVelBase concepts and definitions, followed by a discussion of very basic database philosophy. Each chapter focuses on one section of the program, describing default settings and available options. The documentation occasionally seems insulting to the reader. For instance, most people don't need to be reminded that the program should be installed before it's run.

Considering its limitations, bugs, and obtuse user interface, we find it impossible to recommend PRO-dVelBase. Our advice is to look elsewhere for a non-programmable database system.

Symantec Corp.

Q&A

BY STEPHEN W. PLAIN

Symantec Corp.'s Q&A, a \$399 DOS-based package, has long been one of the most popular products in the low-end database category. It was our Editors' Choice (along with Alpha Four) in our last review of non-programmables. But Q&A has not kept pace with the fast-moving competition; there have been no upgrades to the package (Version 2.1) since our last review, during which time many new products have appeared on the market. Symantec says it intends to continue to support the product, but would not make any announcements about future upgrades.

Q&A's approach to creating a database form is straightforward. To define a new database you take a blank form-design screen and type the field names, followed by a colon. Q&A recognizes anything before the colon as the data

SUITABILITY TO TASK

	Q&A			
	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	●	○
Queries	●	●	●	○
Reports	●	●	●	○
Applications development	●	●	●	○

field. The major drawback to this approach is that you are limited to one form per database.

Beyond simple flat-file database creation, Q&A must be programmed in order to accomplish many of the forms-design functions that its competitors can handle without programming. For example, the process of specifying field navigation within a form or specifying a calculated field is a separate process from the form-design steps.

Navigating through Q&A is simple. It uses a menu system with one-letter choices for each option and mouse support throughout. The menu structure can sometimes be unintuitive. For example, to attach an index to a field, you must wade down four levels from the main menu.

Q&A uses a proprietary database for-

Q&A Programming Options Screen:

Field Name: []
 Address: []
 City: []
 State: []
 Zip: []
 Phone: []
 Email: []
 Password: []
 Confirm: []
 Cancel: []
 OK: []

Some of Q&A's programming options can be inconvenient. For instance, the field navigation order on a form is specified on a separate screen.

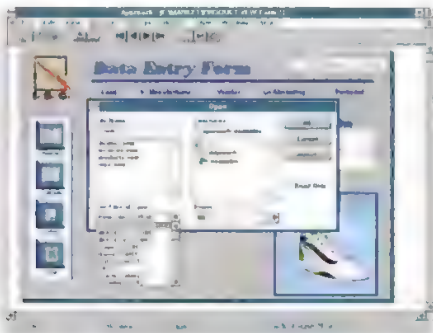
APPROACH 2.0 FOR WINDOWS. FOR PEOPLE WHO DON'T WANT TO GIVE UP THEIR OLD DATABASE.

AND PEOPLE WHO DO.



Approach™ for Windows™.

The critics loved it. Users made it an overnight bestseller. And now we've made it even better.



The original was tough to beat, but Version 2.0 has over 50 new features, that make it even better.

Introducing Approach 2.0 for Windows. We've given it more than 50 improvements including automatic mailmerge, dramatic security enhancements and 100% increase in speed.

Just like the original, Version 2.0 lets you build and manage a database with absolutely no programming. And it's ideal for managing all the information you

need to run your business. Including contact management, sales tracking, invoicing, and all your mailing.

In Version 1.0, our PowerKey™ Technology let you work with dBASE®, Paradox® and Oracle® SQL data in its native format. Now, with Version 2.0 you get the same direct access to FoxPro®, SQL Server and DB2™ data. Anywhere on your network. With no imports or filters. Giving you optimal performance.

From now until March 31, 1993 if you upgrade from any other database, Approach 2.0 for Windows is only \$149*.

So you get all the benefits of Windows. And you get to keep all the value in your company's old data files.

When you get right down to it, that's why we developed Approach for Windows in the first place.



"Every database claims to be easy to use. Approach for Windows really is," says Dennis Allen, Editor in Chief of BYTE Magazine.



Trade up from your old database for only \$148. Without giving up your old data.



APPROACH FOR WINDOWS
Approachable. Relational. Compatible.

*Offer available to owners of dBASE, Paradox, FoxPro, Alpha, SuperBase, DataEase, Q&A, rBase, DataPerfect, DataFlex, FileMaker, Panorama, ObjectVision or Access. Offer expires March 31, 1993. Suggested retail price is \$399. Registered owners of Approach 1.0 for Windows can upgrade to Version 2.0 for \$49 or for free with proof of purchase on or after August 1, 1992.

For information, or to order, call your local dealer or
1-800-APPROACH.

APPLICATIONS DEVELOPMENT
Nonprogrammable Databases



Q&A's query facility, the Intelligent Assistant, can be customized to understand jargon specific to a particular business.

mat. But its support for delimited ASCII files and dBASE, Lotus 1-2-3, Paradox (versions 2.0 through 3.5), Professional File, and Symphony files means that data conversion should not be a problem for most users. The package also exports to a number of file formats in addition to ASCII.

The program does not have the capability to dynamically join multiple tables on key fields. Instead, related data in separate files is retrieved via a set of lookup commands and functions. In addition, every time you create a database there is also a built-in associated lookup table. This useful though easily overlooked feature lets you refer to information in other tables. For instance, you might automatically substitute the full name of a state when the appropriate abbreviation is entered, or you could bring up changeable data such as the name of the salesperson associated with a particular sales code.

Q&A also has a posting feature that lets you make batch updates from one file to another; optionally, you can have it perform mathematical operations on the data along the way.

THE INTELLIGENT ASSISTANT

One unique and popular feature of Q&A is its Intelligent Assistant, an English language-based query facility that comes with 600 built-in words and phrases. You teach the Intelligent Assistant about your database by answering a series of ques-

tions, which establish everything from synonyms for various fields to relationships between verbs and fields. For example, you can define the effect that the verbs "pay" and "earn" would have on the "salary" field. To retrieve data with the Intelligent Assistant, you simply type in a question such as "How many

days accrued vacation time does Steve have?" With some initial devotion to teaching the Intelligent Assistant about your database, you can develop a surprisingly consistent, specific, and accurate retrieval system.

ROBUST REPORT-WRITING

Q&A provides a robust set of macro functions for use with forms and reports. Both columnar and cross-tabulated reports are supported. You can customize the columnar report, but options are limited without programming. To print subtotals at the end of each page, for in-

stance, you must create calculated columns to keep track of line numbers so you can print the subtotals in the right spot. The cross-tabulated report option offers an easy way to generate summary values.

Q&A's built-in word processor can be used to create letters for mail merges and comes with a spell-checker and a thesaurus. It can import and export texts in ASCII, DCA, Microsoft Word, MultiMate, Professional Write, WordPerfect, and WordStar formats. There is also a mailing label section that lets you design your own labels or choose from the standard Avery sizes.

To create a Q&A application you can design menu structures and attach macros. A separate manual is also provided for those who want to create more sophisticated applications.

Although the basic Q&A package is for a single user, it comes with multiuser capabilities. Three-user LAN add-on packs are available for \$499. Q&A has record-level locking and provides automatic real-time updating of users' screens if another user modifies data. There is also built-in SQL link capability; Symantec offers drivers for Oracle and Gupta database servers.

NOT SIMPLE ENOUGH

Q&A's learning curve gets steep once you go beyond the most simple database creation. We were impressed with this product previously and it still does some things well. Its built-in word processor makes it an excellent choice for mail-merge applications. But Q&A simply has not kept up with the competition's push toward simpler, more powerful products.

Fairhaven Software Inc.

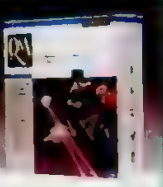
Ultra-Plus

BY JOE SALEMI

Nutshell was one of the original flat-file database managers for PCs and is known for its clean, intuitive interface and well-chosen feature set. The latest version, which now carries the moniker Ultra-Plus, maintains the simple Nutshell interface while adding a bit of extra power. For example, files can now be of unlimited size, whereas they were previously limited to 32MB. At the time of this re-

FACT FILE

Q&A, Version 4.0
Symantec Corp., 10201 Torre Ave.,
Cupertino, CA 95014; 800-441-7234,
408-253-9600; fax, 408-255-3344



List price: for multuser version with one active user, \$399; for three-user network pack, \$499
Requires: 512K RAM, 3MB hard disk space, DOS 2.0 or later
In short: Q&A, best known for its plain English-based Intelligent Assistant query facility, has not been updated for some time. Although simple tasks are easy to do, more complex tasks require the use of commands and functions, unlike most of the newer products. Q&A's built-in word processor makes it a good choice for mail-merge applications; it also supports built-in cross-tabulated reports. But for sophisticated applications, you'll want one of the newer products

 506 ON READER SERVICE CARD



Claudia did not have the finances to finish college. Excess inventory donations to EAL gave her the scholarship she needed to graduate. Claudia is now with a leading financial trading firm, happily married with twin daughters.

**Turn your excess inventory into a
tax break and help send needy
kids to college.**

**Call for your free guide to learn how
donating your slow moving inventory can
mean a generous tax write off for your company.**

**Call 708-690-0010
PETER ROSKAM
Executive Director**



P. O. Box 3021, Glen Ellyn, IL 60138 FAX (708) 690-0565

Excess inventory today...student opportunity tomorrow

APPLICATIONS DEVELOPMENT

Nonprogrammable Databases

view, Ultra-Plus, Version 2.5, was available only as a \$129 upgrade for registered users of Nutshell Plus II. Fairhaven Software will have released the \$395 standalone version by the time you read this.

A CLEAN INTERFACE

The Ultra-Plus interface revolves around its Browse screen, which consists of a status line on top, a central section, and

SUITABILITY TO TASK				
Ultra-Plus				
	POOR	FAIR	GOOD	EXCELLENT
Database administration	●	●	○	○
Queries	●	●	○	○
Reports	●	○	○	○
Applications development	●	○	○	○

a menu line on the bottom. You choose menu items by using the Alt key in combination with the first letter of the desired menu choice, which then brings up the submenu for that item. (There is no mouse support.)

You create databases through the Define submenu, where you specify data types, display formats, and validation rules for fields. The process of defining the database creates the initial Browse screen layout, which consists of two vertical columns with the field names on the left and the data next to the name. You can create any number of layouts to view or print data. Switching between different layouts is as simple as activating the

Layout menu and using the PgUp and PgDn keys to scroll through the defined layouts until you find the one you want to use. Ultra-Plus defaults to the last layout used when you reopen the database in future sessions. The same layouts are used for both on-screen and printed reports.

Ultra-Plus treats every field as text and indexes all but calculated fields. The data-type definitions control how the program handles and displays data. This storage method lets you include text in a numeric field and still perform calculations on the field; Ultra-Plus simply ignores the text. Although indexing all fields slows up data loading, it makes data searching especially fast.

Ultra-Plus has some built-in mail-merge capabilities. The Merge format lets you export data for use by word processors such as Microsoft Word and WordStar. You can also create mail-merge letters within Ultra-Plus. An option lets you specify that spaces between fields be closed up during printing. Mailing labels can be printed by manually creating the appropriate layout, but there is no built-in support for standard label formats as is found in some other packages.

Fairhaven Software sells a version of Ultra-Plus that converts and prints ASCII input as bar codes. While it can be used for any bar code applications, its primary use is to convert address information into the bar code system now being used by the U.S. Postal Service.

LIMITED HIGH-END FEATURES

The Ultra-Plus system provides access to related database tables through lookup



Ultra-Plus lets you look up data in secondary files and display it on-screen or in printed reports along with data from the primary file.

fields. When a layout contains a lookup field, Ultra-Plus fills the field with data from the first matching record it finds in the secondary file. The Zoom option, however, puts you into the secondary da-

Ultra-Plus's Zoom option puts you in the secondary database, where you can browse all related records.

tabase, where you can browse all the records that match the lookup criteria. If no records match, Ultra-Plus lets you browse the entire database. From this screen you can manipulate the secondary database as if it were the first one opened.

Ultra-Plus queries are forms-based and use whichever layout is currently active. In addition to the usual search operators such as "greater than" or "less than or equal to," Ultra-Plus supports search ranges and whole or partial word searches. Unfortunately, searches can't be done on calculated or lookup fields.

Data import and export are limited to fixed and delimited ASCII text and dBASE, DIF, Nutshell, FileMaker Pro and WordStar Merge formats. Because it handles all data as text strings, importing fixed ASCII files can be tricky; you have



Ultra-Plus's interface makes it easy to specify where and how data is displayed. Users can create a number of layouts for viewing or printing data.

APPLICATIONS DEVELOPMENT
Nonprogrammable Databases

to create a layout that exactly matches the size of fields in the import file, and include a two-character "fill" field to hold the CR/LF combination at the end of each fixed record. Once the data is imported, you can remove the fill field from the database.

Ultra-Plus lacks applications development features, but most tasks can be automated with macros. Macros can be created by recording keystrokes or by picking functions from a list and can be nested. However, the only built-in analysis functions are for totals, averages, and record counts. You can run a database macro from a pop-up menu or associate it with a Ctrl-key combination. There is no multiuser capability.

HELP ON A SLIDING SCALE

Ultra-Plus's on-line help is context-sensitive. A line that appears at the bot-

tom of every help screen points to the pages in the manual where the particular topic is covered in more detail—a nice touch. The manual is well laid out and walks the user through the menus as it explains a product feature.

Ultra-Plus is an excellent low-end database with a clean and simple interface.

Fairhaven provides an automated help line for solving common problems; additional support is available from technicians on a toll-free line. The first call is free, and additional calls during the first 30 days are generally free. Fairhaven evaluates the nature of the calls during the first 30 days to determine if the caller should be charged or not. After that, each call costs \$20. Calls reporting bugs in the program are always free, as are the updates that fix the bugs.

Ultra-Plus is an excellent low-end nonprogrammable database. The program's clean and simple interface means

FACT FILE	
Ultra-Plus, Version 2.5 Fairhaven Software Inc., P.O. Box 57, 3 Cabot Pl., Stoughton, MA 02072; 800-582- 4747, 617-341-1990; fax, 617-344-4640	
	List price: \$395; upgrade from Nutshell Plus II 2.0 (the previous version of the package), \$129.
	Requires: 384K RAM, 1.5MB hard disk space, DOS 3.3 or later.
	In short: Fairhaven Software's Ultra-Plus is a low-end DOS-based database system with a well-chosen feature set and a user-friendly interface. While it lacks some of its competitors' advanced features, it is an excellent choice for those with moderate requirements.
 507 ON-READER SERVICE CARD	

users can quickly have it up and running. Though it might have fewer features than other products in this category, it has exactly the feature set needed for the typical user of a nonprogrammable database system. □

DON'T GIVE MONEY TO STRANGERS.

Before you give to a heart organization, make sure it's one you trust: The American Heart Association. Since 1924 we've sponsored lifesaving education programs and funded \$900 million in research. Others may copy us, but they can't hold a candle to our heart and torch. To learn more, contact the American Heart Association, 7320 Greenville Ave., Box 20, Dallas, TX 75231.

You can help prevent heart disease. We can tell you how.



American Heart Association

This space provided as a public service.

DELL ADDS ANO TO THE COMPU

DIMENSION
386SX/25

\$1,199

Lease: \$44/MO.

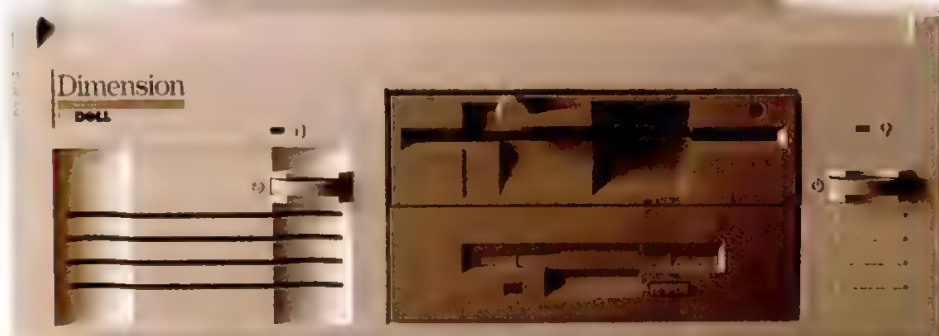
i386™ SX 25 MHz System
2 MB RAM
80 MB (16 ms) Hard Drive
3 Drive Bays
4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Super VGA 1024i Monitor
(14", 1024 x 768, .28 mm)
MS-DOS® 5.0/Microsoft® Windows™ 3.1/
Mouse

DIMENSION
386DX/33

\$1,449

Lease: \$54/MO

i386 DX 33 MHz System
4 MB RAM
80 MB (16 ms) Hard Drive
3 Drive Bays • 4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Super VGA 1024i Monitor
(14", 1024 x 768, .28 mm)
MS-DOS 5.0/Microsoft Windows 3.1/
Mouse



THE OTHER DIMENSION IN COMPUTER PRICE WARS.



DIMENSION
386SX/25
\$1,299

Lease: \$48/MO.

i386 SX 25 MHz System
4 MB RAM
80 MB (16 ms) Hard Drive
3 Drive Bays
4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Super VGA 1024i Monitor
(14", 1024 x 768, .28mm)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse



DIMENSION
386SX/25
\$1,499

Lease: \$55/MO.

i386 SX 25 MHz System
4 MB RAM
120 MB (16 ms) Hard Drive
3 Drive Bays
4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Ultra VGA 1024i Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

DIMENSION
386DX/33
\$1,549

Lease: \$57/MO.

i386 DX 33 MHz System
4 MB RAM
120 MB (16 ms) Hard Drive
3 Drive Bays
4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Super VGA 1024i Monitor
(14", 1024 x 768, .28mm)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

DIMENSION
386DX/33
\$1,649

Lease: \$61/MO.

i386 DX 33 MHz System
4 MB RAM
120 MB (16 ms) Hard Drive
3 Drive Bays
4 Expansion Slots
Dual Floppy Drives (3.5" and 5.25")
256 KB Video RAM
Ultra VGA 1024i Monitor
(14", 1024 x 768, .28mm, non-interlaced)
MS-DOS 5.0/Microsoft Windows 3.1/Mouse

The other major computer makers have finally lowered their prices.

The catch is, there's no telling what else they've lowered. And if you buy from a company that makes compromises to lower prices, you may get exactly what you pay for.

A cheap computer.

On the other hand, we can give you the Dell® Dimension™ 386 systems — as well as 486 and notebook systems — at lower prices without sacrificing features or quality. Because we deal directly with our customers, cutting out the middlemen our competitors use.

Each Dell Dimension system is manufactured to our exacting standards, and fully backed by the fastest-growing PC company in the FORTUNE 500®. Just like every one of the over half-million systems we shipped over the last twelve months.

So call and order a Dimension system. Then sit back and enjoy the price wars. Because it's you who will end up the winner.

DELL™

800-284-1150

WHEN CALLING, PLEASE REFERENCE #11BCE

HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT 10AM-3PM CT SUN
IN CANADA, CALL 800-668-3021

*Leasing arranged by Leasing Group, Inc. i386 is a trademark and the Intel Inside logo is a registered trademark of Intel Corporation. MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. FORTUNE 500 is a registered trademark of The Time Inc. Magazine Company. Dell disclaims proprietary interest in the marks and names of others. ©1993 Dell Computer Corporation. All rights reserved.

Finding the Length of a String Hiding the Date and Time Stamp

BY NEIL J. RUBENKING

FINDING THE LENGTH OF A STRING

Do you need to find the length of single or multiple strings using a batch file? **LENGTH.BAT** (Figure 1) will check the length of one or more lines of text and return the length in the **LEN** environment variable for use in your batch file. The batch file can also be used to help count characters for formatting. The routine works with all but a few special characters in DOS 3.3 through 5.0.

LENGTH.BAT puts the input text into a temporary file and gets the size of that file (which is the length of the input text) into the environment variable **LEN**. A null string as input will yield a 0 in **LEN**. Note that control characters display as two characters, a caret plus a second character. Here are some of the batch file's significant features:

- It can determine the length of large strings quickly because it doesn't manipulate the string one character at a time.
- It can check many lines of text at once.
- It can handle extra spaces and special characters without any problem.
- It determines the length of the string directly from the DOS file.

*Robert W. Miller
Beaverton, Oregon*

► **PC MAGAZINE:** **LENGTH.BAT** is a clever piece of batch programming, reflecting an uncommon knowledge of precisely how the DOS commands work. It's short, but every line counts.

To start, this batch file clears the screen and prompts the user to enter a string and then to end the string by pressing Ctrl-Z and Enter. The line

```
COPY CON $$$BAT > NUL
```

copies from the **CON** device (the keyboard) to the temporary file **\$\$\$BAT**. Redirecting the output of this command

to **NUL** suppresses the "1 file(s) copied" message. Ctrl-Z is the end-of-file control character: When the user enters Ctrl-Z, the **COPY** command stops copying from the **CON** device.

At this point, the file **\$\$\$BAT** contains whatever the user typed before pressing Ctrl-Z, whether it's one line or several. But if the user typed nothing before entering Ctrl-Z, the file **\$\$\$BAT** will not exist. If it did exist before the **COPY** command, it will be wiped out. This is **COPY**'s standard behavior when the source file or device is totally empty.

The next line creates the temporary file **\$\$BAT**. If **\$\$\$BAT** exists, the output of the command **TYPE \$\$\$BAT** is redirected into **\$\$BAT**, effectively copying **\$\$\$BAT** to **\$\$BAT**. If **\$\$\$BAT** does not exist, the **TYPE** command is not executed, but output is still redirected into **\$\$BAT**. That has the effect of creating **\$\$BAT** as a 0-byte file. Thus **\$\$BAT** is a file containing precisely what the user typed—even if the user typed nothing!

The line beginning with **DIR** puts the directory entry for **\$\$BAT** into **\$\$\$BAT**, wiping out the previous contents of **\$\$\$BAT**. It pipes the output of the **DIR** command through **FIND** to fil-

LENGTH.BAT

Complete Listing

```
@ECHO OFF
CLS
ECHO Type STRING. End STRING with Ctrl-Z (F6),
ECHO and then Enter.
COPY CON $$$BAT > NUL
IF EXIST $$$BAT TYPE $$$BAT > $$BAT
DIR $$BAT | FIND "$$ " > $$$BAT
ECHO SET LEN=%2> $$BAT
CALL $$$
ECHO STRING LENGTH = %LEN%
DEL $$BAT
ECHO Finished!
```

Figure 1: Here is a file-based method for determining the length of one or more lines of text.

ter out all lines that do not contain **\$\$** followed by a space and redirects the one line that remains into **\$\$\$BAT**. (Note that this command will fail in the unlikely event that the current drive's volume label or the current directory contains **\$\$** followed by a space.)

\$\$\$BAT now contains the directory entry for **\$\$BAT**, in which the file size represents the number of characters in the input text. The next line wipes out **\$\$BAT** and replaces it with the single command **SET LEN=%2**. The line that creates **\$\$BAT** actually contains two percent signs, but DOS replaces them with a single percent sign at runtime.

All of the foregoing serves to set up the current situation. The line **CALL \$\$\$BAT** executes **\$\$\$BAT**, whose single line resembles:

```
$$ BAT 26 07-20-92 4:03a
```

When DOS executes this line, it calls **\$\$BAT**, and the remaining elements of the directory listing become parameters to **\$\$BAT**. The line **SET LEN=%2** sets the environment variable **LEN** to the second parameter—the desired file size. After returning, **LENGTH.BAT** simply reports the length of the input string and

IN THIS SECTION

Tutor 318
Lab Notes 321
Utilities 327
Environments 333
Power Programming 339
Solutions 357

deletes the temporary files. It leaves the e-var LEN intact, available for use in other batch files.

This technique could be used to get the length of an environment variable or command line parameter. Simply replace the COPY CON line with a line like ECHO %varname%> \$\$\$\$.BAT or ECHO %1> \$\$\$\$.BAT. (You can download LENGTH.BAT from PC MagNet as LENGT2.BAT.)

HIDING THE DATE AND TIME STAMP

You can make a file stand out in a directory listing by removing the file's date and time stamp. It used to be the case that the time would not be printed if it were set to midnight, but this isn't true with recent versions of DOS. However, a quirk of DOS causes a file's date and time to be suppressed completely in a directory listing if its date is 00-00-1980.

Some utilities (like PC Tools) will allow such a modification to a time stamp, but PC Magazine's TOUCH.COM utility will do this with a very simple twist. Setting the month and day to 256 with TOUCH seems to have the effect of setting the month and day to 0. The one-line batch file ZFIL.BAT, below, will zero a file's date stamp if TOUCH.COM is on your path:

```
TOUCH %1 /D 256/256/1980 /T 0
```

This also sets the time to 12:00a, though that's not necessary. And use care—TOUCH accepts any wildcards used in ZFIL's arguments.

My original motivation was to make directories stand out by giving them a blank date and time field. This worked in old versions of DOS if you set the system date and time to 01-01-1980 and

12:00a just before issuing the MKDIR command. I haven't figured out how to do this with the more recent DOS versions, but there's still a lot you can do hiding the date stamp for files.

Norman D. Stockwell
Redondo Beach, California

► **PC MAGAZINE:** TOUCH.COM was the utility program presented in the April 12, 1988, issue of PC Magazine; you can download it from PC MagNet. Do note that there are other utilities named TOUCH.COM, and they don't all work the same way as the PC Magazine version. One popular variation simply sets the date/time stamp of the specified files to the current date and time. If ZFIL.BAT doesn't seem to work for you, double-check and make sure you're using the right TOUCH.COM. Figure 2 is a section of a directory listing that shows what an impression you can make by using ZFIL.BAT. This technique works in any DOS version from 2.0 onward.

The date/time stamp for a file is represented by a 4-byte number in the directory entry. If you examine the directory entry with a disk sector editor, you'll find that this number is 0 in files processed by ZFIL.BAT. Using a disk sector editor, you can set the date/time stamp field for a subdirectory to 0 as well. That's one way to suppress the date/time stamp for directories.

FINDING FREE DISK SPACE

I often need to know how much free space I have on my hard disk. If I use the DIR command, its output causes any data on the screen to scroll off. Attempting to reduce that output by entering DIR with a nonexistent filename merely gives you the useless "File not found" message. In your April 10, 1990, column, you published a method for patching DOS 3.3's COMMAND.COM to make the DIR command display the number of bytes free even when applied to a nonexistent filename. But the following technique works for all versions of DOS from 3.3 through 5.0 and requires no disk space to implement.

For any hard (or floppy disk) drive, simply enter the command TYPE NUL > \S. You can use any dummy filename in place of S;

pick one letter. Then, from any directory on that drive, enter DIR \S. and you'll see that single 0-byte file entry, along with the bytes free. Include the trailing period to prevent display of any files such as S.BAT or S.COM in the root directory.

C. Gary Phifer
via ZiffNet

► **PC MAGAZINE:** As the earlier User-to-User article demonstrated, it is possible to patch COMMAND.COM so the DIR command returns the bytes free even when no files match the file specification passed to it. However, any technique that relies on patching COMMAND.COM will be obsolete the moment DOS gets an upgrade. This solution, creating a 0-byte file and listing the directory of that file alone, works for any DOS version back to the venerable 2.0.

Even so, DOS 5.0 uses nine screen lines for a DIR listing of a single file. Since the original concern was to prevent data from scrolling off the screen, I created BYTEFREE.BAT, shown below,

```
@ECHO OFF
ECHO Current drive has...
REM > \ ^&()@#{}.$$$
DIR \ ^&()@#{}.$$$ | FIND "bytes free"
DEL \ ^&()@#{}.$$$
```

in order to reduce the output to just two lines. Mr. Phifer suggested using a file named S, presumably because it's Simple to remember. BYTEFREE.BAT doesn't have to rely on human memory, so it uses the bizarre filename &()@#{}.\$\$\$.

BYTEFREE.BAT creates a 0-byte file using the command REM > \&()@#{}.\$\$\$ (Redirecting the output of REM is another way to create a 0-byte file.) Next it pipes the output of the directory listing of that file through the FIND filter, selecting only lines that contain the string "bytes free." Finally it deletes the oddly named file.

As written, BYTEFREE.BAT displays the string "Current drive has..." followed by the number of bytes free. If screen space is at a premium, delete the ECHO line that displays that string. □

Share your latest DOS and systems discoveries through User-to-User. See the "How to Contact Us" sidebar in the Solutions column.

DIRECTORY LISTING

```
Volume in drive E is MONSTER003
Volume Serial Number is 3462-14E4
Directory of E:\U2U\6\64\TEMP

.                <DIR>      06-08-92   3:17p
..               <DIR>      06-08-92   3:17p
READ ME         8965 06-09-92  12:13p
HEY YOU! YOU    0
BETTER READ     0
THE READ ME     0
FILE!!!!!!      0
7 file(s)       8965 bytes
                21991424 bytes free
```

Figure 2: Files whose dates and times are suppressed using ZFIL.BAT really stand out in a directory listing.

A Look Inside Windows Icons, Part 1

BY JEFF PROSISE

Have you ever wondered how Windows handles icons and what's inside those .ICO files? I have, since I began gathering information to write a Windows icon editor. My digging uncovered a treasure trove of information. In this issue, I'm going to dive a little deeper than I usually do in this column and explain the inner workings of Windows and the GDI (Graphics Device Interface).

THE .ICO FORMAT To discuss icons, we need to look at their format. Volume 4 of the Windows 3.1 SDK spells out the icon resource file format, which begins with the icon directory structure `ICONDIR`, shown here:

```
typedef struct ICONDIR {
    WORD idReserved;
    WORD idType;
    WORD idCount;
    ICONDIRENTRY idEntries[];
} ICONHEADER;
```

This specifies how many icon images the file contains, the size of each, and its color format. The `idReserved` and `idType` entries are always set to 0 and 1, respectively, while `idCount` specifies the number of images in the file. An .ICO file can contain more than one image; all depict the same graphic, but—in order to better match the image to the hardware—each differs in size, resolution, and color format. Windows picks the one to show based on the capabilities of the display adapter. `ICONDIRENTRY` is itself a structure, defined as follows:

```
struct IconDirectoryEntry {
    BYTE bWidth;
    BYTE bHeight;
    BYTE bColorCount;
    BYTE bReserved;
```

```
    WORD wPlanes;
    WORD wBitCount;
    DWORD dwBytesInRes;
    DWORD dwImageOffset;
} ICONDIRENTRY;
```

where `bWidth` specifies the icon's width, `bHeight` gives its height, (both in pixels) and `bColorCount` holds the size of the *color palette* (collection of available colors) used for the image. The most common type of icon measures 32 by 32 pixels and uses a 16-color palette, which would make the structure's first three fields 32, 32, and 16, respectively.

Typically, `bReserved`, `wPlanes` and `wBitCount` are not used in icon resource files and, therefore, are set to 0. Finally, `dwBytesInRes` specifies the number of bytes in the image, and `dwImageOffset` gives the image's location as an offset from the beginning of the file. The icon directory contains one `ICONDIRENTRY` structure for *each* image in the icon resource file.

Following the directory structure comes the icon image itself or, if the file contains more than one icon, a series of images. An image consists of four parts: a bitmap information header, an RGB color table, an XOR mask, and an AND mask, in that order. The header, which we'll cover shortly, is based on yet another data structure. The RGB color table defines each color used to paint the image in terms of red-green-blue components. The XOR and AND masks contain the actual bitmap information used to display the image on the screen.

The bitmap information header is defined in C as follows:

```
typedef struct tabBITMAPINFOHEADER {
    DWORD biSize;
    LONG biWidth;
    LONG biHeight;
    WORD biPlanes;
```

```
    WORD biBitCount;
    DWORD biCompression;
    DWORD biSizeImage;
    LONG biXPelsPerMeter;
    LONG biYPelsPerMeter;
    DWORD biClrUsed;
    DWORD biClrImportant;
} BITMAPINFOHEADER;
```

The `biSize` entry specifies the number of bytes in the bitmap information header and is always 40. For a 32 by 32 icon, `biWidth` is 32 but `biHeight` is 64 since the icon actually displayed on the screen is formed from two bit masks (XOR and AND), each containing 32 rows.

Together, `biPlanes` and `biBitCount` define the number of colors used in the icon's bitmap. For a 16-color image, `biBitCount` would be 4. In current implementations of Windows, `biPlanes`, which specifies the number of *color planes* used to create the image, must be set to 1. (Some display adapters divide their memory into color planes or layers that each control a different color. Icons, however, use the device-independent bitmap format introduced in Windows 3.0 and don't depend on the characteristics of a particular device. Thus, whatever the hardware, `biPlanes` should be 1. For an excellent tutorial on bitmaps, see Charles Petzold's series starting with the May 28, 1991, *Environments* column.)

The `biSizeImage` parameter specifies the combined length of the XOR and AND masks, in bytes. For a 32 by 32 16-color image, its value will be 640: 512 bytes for the XOR mask and 128 for the AND mask. (The section below on XOR and AND masks shows how these numbers originate.) All other fields in the structure should be set to 0.

The RGB color table comes after the bitmap information header and holds as many color entries (at 4 bytes each) as `ICONDIRENTRY`'s `bColorCount` field

Format of the RGB Color Table

Offset	Description	Byte 1	Byte 2	Byte 3	Byte 4
00h	Color 1	Blue	Green	Red	Not used
04h	Color 2	Blue	Green	Red	Not used
08h	Color 3	Blue	Green	Red	Not used
0Ch	Color 4	Blue	Green	Red	Not used
.	.	.	.	.	.
??h	Color n	Blue	Green	Red	Not used

Figure 1: The color table defines the RGB color components of the colors used in the icon bitmap.

specifies—16 for a 16-color icon. Figure 1 shows the format of the color table. Each entry defines the RGB color mix for one of the colors used in the icon image. Individual bytes may take any value from 0 to 255, with the first denoting the amount of blue; the second, green; and the third, red. The fourth byte remains unused and must be set to 0.

The colors defined in the color table will vary from icon to icon depending on the icon editor used to create the image and whether the user has adjusted the editor's color palette. The default color table written to the icon resource file by the image editor supplied in the Windows 3.1 SDK includes black, white, and two shades each of red, green, yellow, blue, magenta, cyan, and gray.

THE XOR AND AND MASKS After the RGB color table comes the XOR mask that, for each pixel in the icon image, contains the number of bits defined in the bitmap information header's *biBitCount* field. A 16-color (4 bits per pixel), 32 by 32 icon's XOR mask will contain 4*1,024 bits—512 bytes. The AND mask comes next and contains 1 bit for each pixel in the icon image, so a 32-pixel-square icon will be 1*1,024 bits, or 128 bytes long.

Dividing a bitmap into AND and XOR masks might seem like an odd way to do business, but it makes three interesting effects possible. You can leave a pixel unchanged—the method developers use to place *transparent* (see below) pixels in icon images—invert it, or set it to a specified color.

Windows employs a two-step procedure to paint the icon's image on the screen. First it applies the AND mask by ANDing each bit (either a 0 or 1) in the AND mask with the corresponding display pixel. A 0 in the mask blacks out the underlying pixel. When Windows then

applies the XOR mask in step two, the pixel takes on the color designated by the corresponding position in this XOR mask. Thus, to set a pixel to a specified color, you simply set the corresponding bit in the AND mask to 0 and place the desired color value in the XOR mask.

A 1 in the AND mask leaves the underlying screen pixel unchanged. If the corresponding pixel in the XOR mask is all 0's (black), the pixel from the underlying screen comes through unchanged. If all 1's (white), the pixel from the underlying screen has its color inverted. To draw a transparent pixel, you set the bit in the AND mask to 1 and the corresponding bits in the XOR mask to 0. ANDing a bit with 1 doesn't change its original value nor does XORing it with 0, so the pixel will be the same at the end of the operation as at the start. To invert the color, you still set the AND mask bit to 1 (leaving the pixel's value unchanged after performing the AND), but you also make all of the corresponding XOR mask bits 1s. Since XOR of 1 with 1 produces 0 and with 0 produces 1, the bits that define the pixel's color on the screen will be flipped.

If you haven't worked with computer graphics before, this may sound a little complicated. Breaking a bitmap into separate AND and XOR masks is really quite commonplace, though, and a powerful technique for controlling the way a bitmapped image interacts with images that it overlays on the screen.

Figure 2 illustrates graphically

how bits in the AND and XOR masks work together to determine the final color of a pixel. In each example, the color of the pixel before the masks are applied is 0Ah (1010 binary). The first example shows how to place a transparent area in the icon image. The bit value in the AND mask for this pixel is 1, so Windows ANDs 1010 with 1111, yielding 1010. Next, Windows XORs the result with the four bits in the XOR mask that correspond to this pixel (0000), again producing 1010, so the original color is unchanged.

The second example illustrates what happens when the AND mask is 1 and the XOR mask is 1111. ANDing 1010 and 1111 yields 1010, once more leaving the pixel's value unchanged. XORing 1010 with 1111 produces 0101, though—exactly inverting the bits in the original pixel value. Apply these masks to a screen pixel and you reverse its color—a great way to ensure that a pixel in an icon, whatever its initial color, will show up on the display.

The final example illustrates how to set a pixel to a specified color. You zero the bits in the original pixel value by ANDing them with 0, then XOR those 0s with 1100, yielding a final pixel value of 1100. How does Windows know what color to paint the pixel? Simple: It consults the RGB color table in the icon resource file, going to the 13th entry in this case (1100 binary equals 12 decimal, and color table entries are 0-based), then using the RGB color value stored there. If, for example, the color value contains 192 for the blue component, 192 for green, and 0 for red, the resulting pixel will be medium-bright cyan (blue-green).

How the XOR and AND Masks Combine To Determine a Pixel's Color

Leaving a pixel's color intact	1010 AND 1111 = 1010
	1010 XOR 0000 = 1010
Inverting the pixel's color	1010 AND 1111 = 1010
	1010 XOR 1111 = 0101
Setting the pixel to a specified color	1010 AND 0000 = 0000
	0000 XOR 1100 = 1100

Figure 2: XOR and AND masks may be combined to leave a pixel's color unchanged, to invert it, or to set it to a specified color.

Miriam Liskin, PC Magazine, and FoxPro 2.0. Three Pros, No Cons.



ISBN 1-56276-038-6
Price \$39.95

Miriam Liskin, *PC Magazine*, and *FoxPro 2.0*. They're all recognized as the very best at what they do. Now they have teamed up to deliver *PC Magazine Programming FoxPro 2.0*, one exhaustive volume that covers the FoxPro language itself and the practical skills you need to take your applications from first vision to finished product. Concepts and techniques are explained in plain English, and are backed up by one disk full of sample forms, programs, and databases.

Available
at fine
bookstores,
or call

1-800-688-0448
ext. 1215



© 1992 Ziff-Davis Press

Icon Resource File Formats

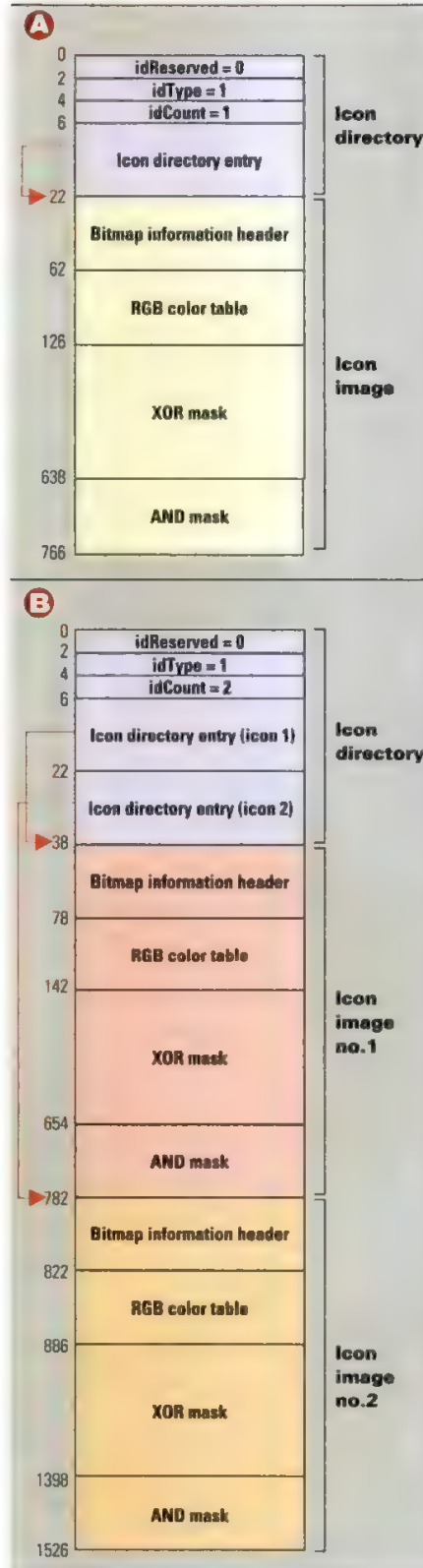


Figure 3: An icon resource file may contain up to 65,535 icon images. Shown here are the formats of icon files containing one icon image (A) and two icon images (B).

Note that the AND and XOR masks are stored in the icon resource file in bottom-up format. As an example, remember the XOR mask for a 32 by 32 16-color icon image, which consists of 32 rows of 16 bytes each (or 32 rows of 32 4-bit nybbles, depending on how you prefer to look at it; each nybble or half-byte corresponds to one pixel horizontally). One row in the mask corresponds to one row of pixels in the icon, but the first 16 bytes in the XOR mask define the *bottom* row of the icon, not the top. The next 16 bytes define the second row from the bottom and so forth until you reach the final 16 bytes in the mask, which correspond to the top row of pixels. The AND mask is also stored in bottom-up format with its first bit corresponding to the pixel in the lower left corner of the icon.

ANATOMY OF AN .ICO FILE The majority of .ICO files that you'll run across are exactly 766 bytes and contain one 16-color icon image 32 pixels wide by 32 pixels high. This is the standard icon image format that Windows uses for color EGA, VGA, Super VGA, and 8514/A displays.

Figure 3a depicts the format of a 766-byte icon resource file. The first 22 bytes are devoted to the icon directory: two bytes each for the idReserved, idType, and idCount fields; and 16 bytes for one icon directory entry structure. The bitmap information header begins at offset 22, followed by the RGB color table at offset 62, the XOR mask at 126, and the AND mask at 638.

Figure 3b diagrams the format of an icon resource file that contains two images. The icon directory structure now occupies 38 bytes instead of 22 (since it contains two 16-byte icon directory entry structures rather than one), and a second icon image follows the first. The dw-ImageOffset fields in the icon directory entries are set to 38 and 782, respectively, identifying the starting offsets of the individual images. You can extrapolate from these images to outline the format of an icon resource file with any number of icons up to the Windows maximum of 65,535 per file.

In the next issue I'll describe what Windows does with icon files and how it knows what icon to display when you minimize a Windows application. □

PCMCIA: The Expansion System of the Future

BY WINN ROSCH

Even as the debate over Micro Channel, EISA, ISA, and VESA local bus rages, another challenger is quietly gaining momentum as the best choice for future expansion needs. Called the PC Card, this new entrant is not simply a bus. Rather, it incorporates an entire connection architecture within the thickness of a credit card.

Conceived as a way to add expansion capabilities to subnotebook-size computers, the versatile design of the PC Card will make it at home in almost anything electronic, from CAD workstations to auto-everything cameras. Someday you may even find a PC Card lurking in your toaster oven or your music synthesizer.

Such dramatic predictions reflect the virtues and versatility of the underlying standard, and the features of the PC Card design read like a wish list for the expansion standard of the future. PC Cards are compatible with all of the old buses you've grown to know and hate—ISA, Micro Channel, EISA, or what have you. Because they're operating system and device independent, you can plug the same PC Card peripheral into a PC, Mac, Newton, or whatever the next generation holds in store. The PC Card system is self-configuring, so you won't have to deal with DIP switches, fiddle with jumpers, or search for a Reference Diskette again. The design is so robust that you can insert or remove a PC Card with the power on without worrying that you'll damage it, your PC, or data stored on the card. The PC Card standard is even ready for tomorrow's battery-saving low-voltage computer designs.

One key to its success is that the PC Card is not a proprietary standard foisted on the industry by a single company or small coterie. The design is the product

of a group called the Personal Computer Memory Card International Association (PCMCIA), which has more than 220 members involved in all aspects of the computer and electronics industry. The PCMCIA standard is completely open, and all specifications are available to anyone requesting them from the organization. (The charge for the latest specification release was not set at the time of this writing, but it is estimated at between \$200 to \$300. For further information, contact PCMCIA at 1030G E. Duane

*Originally designed for
notebook-size and smaller
PCs, PC Cards offer a whole
new interconnection
architecture that's
compatible with current
and future buses.*

Ave., Sunnyvale, CA 94086; 408-720-0107; fax, 408-720-9416.)

Rather than operate completely independently, PCMCIA cooperates with other standard-setting organizations. Thus, for example, by working jointly with the Japan Electronic Industry Development Association (JEIDA) in December 1989, PCMCIA was able to ensure that the standards it developed would be truly international in scope. Today each organization sends a delegation to the meetings of the other.

Although initially intended simply to add programs to miniature computers that lacked disk drives, in the last year or so PC Cards have grown to embrace a full repertoire of expansion functions.

Besides memory and firmware, high-speed modems and hard disks have been encapsulated into PC Cards. In coming months you can expect to find nearly anything that fits on a PC expansion board downsized to squeeze into a PC Card.

To bring you up to date on this exciting new development, this Lab Notes will look at what PC Cards are, where the idea came from, how they work, and what their potential is for you and your PC.

GIVING THE CARD CREDIT Memory on a credit card-size plug-in board long predates the creation of PCMCIA. As early as 1984 such memory cards served as a means of providing the ROM to store fonts for laser printers. By 1987, memory manufacturers were packaging expansion RAM in similar packages for notebook computers.

The memory-card industry leader at that time was Mitsubishi, whose memory cards used a proprietary 60-pin package. Fujitsu Microelectronics had a similar, competing line of memory cards and "smart cards" (Fujitsu's term for any small card with integrated circuits on it), but these were based on a 68-pin connector design.

John Reimer, now vice president of marketing for SUNDISK and chairman of PCMCIA, was appointed marketing manager for microcomputer products at Fujitsu in 1987. He quickly determined that he had inherited what amounted to a product looking for a purpose. It seemed to Reimer that card memory had the potential to serve as a data exchange medium that lacked the environmental vulnerability of floppy disks (such as dust, temperature, shock, and impact).

While exploring marketing opportunities for his memory cards, Reimer discovered that the Poqet Computer Company was itself investigating the use of memory cards as an alternative to disk

drives for a new product that was ultimately to become the first true subnotebook PC. (Fujitsu had invested in the Poqet startup and has since acquired the company.) But Poqet was so concerned about the lack of standards among the various memory cards that it hesitated to select a memory card product because of uncertainty about which designs would succeed.

Sensible as was Poqet's desire to standardize memory cards throughout the industry, Reimer found that realizing the desire was a practical impossibility. No single standards organization was set up to rule on all the required aspects of such a design: physical card size, number and function of the connector pins, data file formats, and software interface. And to run the different facets of a card design through the whole gamut of separate standards sanctioning organizations might take longer than the useful life of the product!

While promoting the idea that the personal computer industry should itself develop a memory card standard, Reimer discovered that Lotus Development was contemplating putting its software on ROM cards. Lotus had been among the first to embrace putting software on the larger cartridges of the ill-fated PCjr. But Lotus, too, balked at the prospect of a profusion of incompatible card designs, and offered its support when Reimer proposed to bring parties interested in memory card standardization together. Reimer found enough initial support among other major suppliers of software, semiconductors, and personal computers, to convene a meeting of representatives from about 25 manufacturers that took place at the Fairmont Hotel in San Jose in June 1988.

That first informal meeting pointed out the possibilities—including the potential for an antitrust suit. So with \$10,000 contributed by Fujitsu, Reimer hired lawyers to draft guidelines that would avert legal tangles and organized the group that became PCMCIA. At that early point, however, the role and future of the organization were uncertain. Early on, Reimer entertained the possibility that PCMCIA would craft a standard and quietly fade away, mission accomplished. But the organization gained its own momentum at its monthly meetings, and the

standard expanded in scope from a PC enhancement to a universal digital data exchange mechanism.

PC Card, Release 1.0, the first generation of the PCMCIA standard, was introduced in September 1990. It contemplated only the use of solid-state memory on the card as a means of data storage. But the PC Card intrigued both the makers of subnotebook computers and peripheral developers, who believed that the standard could be expanded to incorporate I/O devices as well as memory.

As a result, the PC Card standard was updated in September 1991 to comprise a more generalized interface that would accommodate both storage and input/output devices. Additionally, the new Release 2.0 standard allowed the use of thicker cards, permitting the incorporation of a wider variety of semiconductor circuits. It also allowed programs stored on PC Cards to be executed in the card memory rather than requiring the code to be downloaded into standard RAM.

In keeping with good practice, backward compatibility was maintained: Cards designed under PCMCIA Release 1.0 will plug into and work in Release 2.0 machines. Because Release 2.0 adds a wealth of features that older hardware may not understand, however, all the functions of a new card may not work in an older system. Because normal thickness cards of both generations are physically the same, new cards will fit slots in old systems. No combination of card and system will result in damage at either end of the connection.

Backward compatibility at that early stage was, of course, practically a non-issue. The only device limited solely to PCMCIA Release 1.0 form factor slots was the Poqet subnotebook. Although the Hewlett-Packard 95LX conforms to Release 1.0 electrically, its socket accommodates the thicker cards permitted by Release 2.0.

The completed PCMCIA 2.0 is much more than a simple set of physical specifications for card dimensions and a bus pin-out. The standard also describes file formats and data structures, a method through which a card can convey its configuration and capabilities to its host, a device-independent means of accessing card hardware, and software links independent of operating systems.

The PCMCIA Expansion System

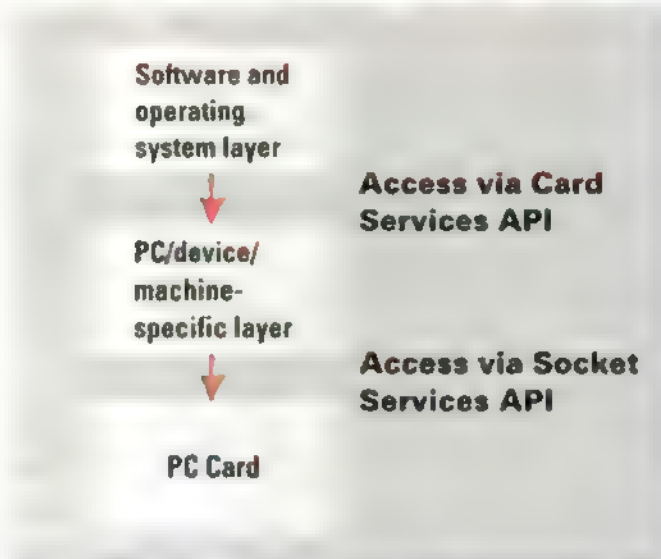


Figure 1: PCMCIA includes not only a computer and host-independent socket for the PC Cards but also program calls that link software into the PCMCIA system.

ARCHITECTURAL OVERVIEW At first glance, PCMCIA 2.0 looks a bit archaic as an expansion bus. It provides only a 16-bit interface; it lacks such advanced features as bus mastering; and it offers but a single interrupt request (IRQ) line. However, because the versatile design of PCMCIA is fundamentally different from that of ordinary expansion buses, any such shortcomings are but temporary. (PCMCIA is working on support for bus-mastering adapters, for example.)

PCMCIA's expansion system is not a simple extension to the bus circuitry of a computer. Rather, it is a system that includes everything from a computer and host-independent socket for the PC Cards to program calls that link software into the PCMCIA system. Figure 1 shows an overview of the PCMCIA expansion system.

A hardware device supporting the PCMCIA standard can have from one to 255 PCMCIA adapters; that is, circuits that match the signals of PC Cards to the host. Up to 16 separate PC Card sockets can be connected to each adapter, much as you can connect two hard disks to an IDE controller or seven devices to a SCSI host adapter. Consequently, PCMCIA 2.0 allows for the possibility of plugging up to 4,080 PC Cards into one system.

The memory and I/O registers of each PC Card are individually mapped into the address range of the host device. Thus the addresses on the card need not be identical with those of the host. The host accesses the PC Card resources through one or more *windows*, which are memory

or register ranges that can be directly addressed by the host. The entire memory on a PC Card can be mapped into a single large window (for simple memory expansion, for example), or it can be paged (like EMS memory) through one or more windows. The PC Card itself determines the access method through configuration information it stores in its own memory.

To link the PC Card to an Intel-architecture PC host, PCMCIA has defined a software interface called Socket Services. By using a set of function calls under interrupt 1A (which Socket Services shares with the CMOS time-of-day clock), software can access PC Card features without specific knowledge of the underlying hardware. In other words, Socket Services makes access to the PC Card hardware independent, much like the BIOS of a PC. In fact, Socket Services are designed so they can be built into the PC BIOS. Socket Services can also be implemented in the form of a device driver, however, so that PCMCIA functionality can be added to existing PCs.

Using Socket Services, the host establishes the windows used by the PC Card for access. Memory or registers can then be directly addressed by the host. Alternatively, individual or multiple bytes can be read or written through Socket Services function calls.

In September 1992, PCMCIA approved a Card Services standard that defines a program interface for accessing PC Cards. This standard establishes a set of program calls that link to those Socket Services that are independent of the host operating system. Like the Socket Services associated with interrupt 1A, Card Services can either be implemented as a driver or be built in as part of an operating system. (Protected-mode operating systems like OS/2 and Windows NT require the latter implementation.)

For an advanced system such as PCMCIA 2.0 to work effectively, each PC Card must be able to identify itself and its characteristics to its computer host. Specifically, it must be able to tell the computer how much storage it contains, the device type (solid-state memory, disk, I/O devices, or other peripherals), the format of the data, the speed capabilities of the card, and any of a multitude of other variables about how the card operates.

Asking you to enter all the required data every time you installed a PC Card would be both inconvenient and dangerous. Considerable typing would be required, and a single errant keystroke could forever erase the data off the card. Therefore, PCMCIA developed a self-contained system through which the basic card setup information can be passed to the host regardless of the data structure of the on-card storage or of the

***The PCMCIA
configuration system
works through a succession
of compatibility layers
to establish the necessary
link between the PC Card
and its host.***

operating system of the host.

Called the Card Identification Structure (CIS) or "metaformat" of the card, the PCMCIA configuration system works through a succession of compatibility layers to establish the necessary link between the PC Card and its host. As with the hardware interface, each layer of CIS is increasingly device specific.

Only the first layer, called the Basic Compatibility Layer, is mandatory under PCMCIA 2.0. This layer indicates how the card's storage is organized. Only two kinds of information are relevant here: the data structures used by the layer itself, and such standard and physical device information as the number of heads, cylinders, and sectors of a physical or emulated disk.

The next layer up is called the Data Recording Format Layer. It specifies how the stored data is organized at the block level. Four data formats are supported under Release 2.0: unchecked blocks, blocks with checksum error correction, blocks with cyclic redundancy error checking, and unblocked data that does not correspond to disk organization (for example, random access to the data, such as would be permitted for memory).

The third CIS layer, the Data Organization Layer, specifies how information is logically organized on the card; that is, it specifies the operating system format to which the data conforms. PCMCIA recognizes four possibilities: DOS, Microsoft's FlaSh file system for Flash RAM, PCMCIA's own execute-in-place (or XIP) ROM image, and application-specific organization. Microsoft's FlaSh file system is an operating system specifically designed for the constraints of Flash memory. It minimizes rewriting specific memory areas to extend the limited life of the medium and to allow for speedy updates of required block writes.

XIP is PCMCIA's own specification that allows program code in read-only memory to execute without being first loaded into main system (read/write) memory. Application-specific organization allows card developers to create data organizations unique to their products so as to implement special features.

The fourth CIS layer is assigned to system-specific standards that comply with particular operating environments. For example, the XIP standard defines how programs encoded on ROM cards are to be read and executed.

The setup information for all these layers is stored in a reserved area on the PC Card called Attribute Memory. This area is isolated from the card's ordinary storage, which, under PCMCIA 2.0, is called Common Memory. The CIS information is structured as a linked chain of data blocks called *tuples*, each of which may be up to 128 bytes long. To give all systems a common starting point to search for CIS data, the first tuple of the metaformat is located at the first address in Attribute Memory. This assures that the data will be within the addressing range of even those primitive microprocessors that can address only one megabyte of RAM. Because the CIS system must work in any PC or other host, it assumes that memory can be accessed only in byte widths.

The first 2 bytes of each tuple, as well as the format of many predefined tuples, are strictly defined. The first byte encodes the function of the tuple and the parameters it describes. The second byte links to the next tuple in the chain (if any); it specifies the number of data bytes in the tuple, which, of course, indicates

Common Tuples		
CODE	NAME	DESCRIPTION
0	CISTPL_NULL	Null tuple; ignore
1	CISTPL_DEVICE	The device-information tuple (Common Memory)
2-7	CISTPL_CHECKSUM	(Reserved for future, upward-compatible versions of the device-information tuple)
8-0Fh	CISTPL_LONGLINK_A	(Reserved for future, incompatible version of the device-information tuple.)
10h	CISTPL_LONGLINK_C	The checksum-control tuple
11h	CISTPL_LINKTARGET	The long-link-control tuple (to Attribute Memory)
12h	CISTPL_NO_LINK	The long-link-control tuple (to Common Memory)
13h	CISTPL_VERS_1	The link-target-control tuple
14h	CISTPL_ALTSTR	The no-link-control tuple
15h	CISTPL_DEVICE_A	The Level-1 version/product-information tuple
16h	CISTPL_JEDEC_C	The alternate-language-string tuple
17h	CISTPL_JEDEC_A	Attribute Memory device information
18h	CISTPL_CFG	JEDEC programming information for Common Memory
19h	CISTPL_ENTRY	JEDEC programming information for Attribute Memory
1Ah	CISTPL_DEVICE_OC	The configurable-card tuple
1Bh	CISTPL_DEVICE_OA	The configuration-entry tuple
1Ch	CISTPL_VERS_2	Other operating conditions device information for Common Memory
1Dh	CISTPL_FORMAT	Other operating conditions device information for Attribute Memory
1Eh-3Fh	CISTPL_GEOMETRY	(Reserved for future standardization)
40h	CISTPL_BYTEORDER	The Level-2 version tuple
41h	CISTPL_DATE	The format tuple

Figure 2: PCMCIA configuration information is stored as a linked chain of data blocks called tuples. Release 2.0 defines options available for these common tuples.

where the next tuple begins. The PCMCIA 2.0 specifications define the options available for many common tuples as shown in Figure 2. PC Card manufacturers are free to add their own tuples to store data for setting up cards that contain proprietary features.

CARD STOCK The centerpiece of PCMCIA 2.0 is the PC Card itself. Measuring 54 by 85 millimeters (2.126 by 3.37 inches) and 3.3 mm (just over $\frac{1}{8}$ inch) thick, the PC Card physically follows the form factor of earlier memory cards (including the IC Card) standardized by JEIDA. The first release of the PCMCIA specification paired this single-size card with a Fujitsu-style 68-pin connector. Under the current PCMCIA 2.0 specification, this form factor is designated as the Type I PC Card.

The thinness of the Type I card proved an unacceptable limitation. Even without allowing for the PC Card packaging, some solid-state devices are themselves thicker than 3.3 mm. Most important among these "fat" devices are the EPROMs used for nonvolatile storage.

(Most PCs use EPROMs to store their system BIOS, for example.) Unlike ordinary, thin ROMs, EPROMs can be reprogrammed, but this requires a transparent window to admit the ultraviolet radiation used to erase the programming of the chip. The windowed packaging makes most EPROMs themselves 3.3 mm or thicker.

Fujitsu had faced this problem when developing the firmware to be encoded on memory cards, and so had developed a somewhat thicker card that could be plugged into the same sockets as could standard memory cards. Modem and other peripheral makers found the Fujitsu fat card more suited to their purposes. To accommodate them, PCMCIA 2.0 standardizes an alternative, Type II PC Card. Essentially based on the old Fujitsu developmental EPROM form factor, Type II PC Cards are 5.0 millimeters thick, but otherwise conform to the same dimensions as Type I cards.

The PCMCIA 2.0 standard puts the extra thickness in a planar bulge, called the substrate area, in the middle of the

card. This thicker area measures 48 mm wide and 75 mm long. Three millimeters along each side of the Type II PC Card are kept to the thinness of the Type I standard so that the same card guides can be used for either card type. Similarly, the front 10 mm of a Type II card maintain the 3.3 mm thickness of the Type I standard so that the same connector can be used for either card type. Naturally, the actual card slot for a Type II PC Card must be wide enough to accommodate the maximum thickness of the card.

In September 1992, PCMCIA approved a third, Type III form factor for PC Cards. These still-thicker cards expand the bulge of Type II from 5 mm to 10.5 mm, and are designed to accommodate miniaturized hard disks and similar mechanical components. As with Type II cards, Type III PC Cards remain thin at the edges to fit standard card guides and to fit standard connectors.

Under Release 2.0, both Type I and Type II cards can be implemented in extended form. That is, their depth can be increased by an additional 50 mm (to 135 mm), in order to hold additional componentry. Such extended cards project about 2 inches more from standard PCMCIA slots.

To insure that all cards will easily and securely mate with their connectors, the PC Card standard requires that card guides be at least 40 mm long and that the PC Card connector must engage and guide the connector pins for 10 mm before the connector bottoms out.

The layout of a PC Card is essentially symmetrical. This means that it could inadvertently be inserted upside down. The PC Card design allows for such cases of brain fade by eliminating the risk of damage. Although the cards won't work while inverted, neither they nor the computers into which they are plugged will suffer damage.

Because the size and placement of labels on the cards is part of the standard, once you're familiar with the layout of one PC Card, you'll know the proper orientation of them all. Moreover, other physical aspects of the cards—the position of the write-protect switch (if any) and battery (if needed)—have been standardized as well. The PCMCIA standard also recommends that the batteries in all cards be oriented in the same

direction (positive terminal up).

In addition to the physical measures that facilitate getting the cards into their sockets, two pins—one on each side of the connector—allow the PC host to determine whether the card is properly seated. If the signal (ground) from one is present and the other is not, the system knows that the card is skewed or that it is otherwise improperly

Although the PCMCIA standard allows for only 16 data lines, the specification is flexible enough to allow for multiplexed 32-bit operation in custom designs.

inserted in the connector.

The one part of the PC Card that has not yet been standardized is the rear edge, where connections are made to communications products such as modems. PCMCIA is currently working on this area and hopes to develop specifications for the connectors and their placement.

PLUGGING IN All types of PC Cards use the same 68-pin connector, whose contacts are arranged in two parallel rows of 34 pins. The lines are spaced at 1.27 mm (0.050 inch) intervals between rows and between adjacent pins in the same row. Male pins on the card engage a single molded socket on the host.

To insure proper powering up of the card, the pins are arranged so that the power and ground connections are longer (3.6 mm) than the signal leads (3.2 mm). Because of their greater length, therefore, power leads engage first so that potentially damaging signals will not be applied to unpowered circuits. The two pins (36 and 67) that signal that the card has been inserted all the way are shorter (2.6 mm) than the signal leads.

As we saw earlier, the standard PCMCIA 2.0 connector itself allows for two PC Card variations: memory-only (which essentially conforms to the Re-

lease 1.0 standard) and I/O cards. Figure 3 lists the pin assignments. All but 10 pins of the standard 68 share common functions between the two card styles (these are designated in the table with asterisks). Four memory card signals are differently defined for I/O cards (pins 16, 33, 62, and 63); three memory card signals are modified for I/O functions (pins 18, 52, and 61); and three pins reserved on memory cards are used by I/O cards (pins 44, 45, and 60).

When a PC Card is plugged into a slot, the host computer's PCMCIA adapter circuitry initially assumes that it is a memory card. The card defines itself as an I/O card through its on-board CIS data, which the host computer reads upon initializing the PC Card.

The PCMCIA 2.0 standard allows for card implementations that use either 8- or 16-bit data buses. In memory operations, two Card Enable signals (pins 7 and 42) set the bus width; pin 7 enables even-numbered address bytes and 42 enables odd bytes. All bytes can be read by an 8-bit system by activating pin 7 but not 42 and toggling the lowest address line (A0, pin 29) to step to the next byte.

Although the current PCMCIA standard allows for only 16 data lines, the specification is flexible enough to allow for multiplexed 32-bit operation in custom designs. Properly implemented, such a card would work with a standard 16-bit interface in devices that comply with Release 2.0, but it could gain full 32-bit power in machines matched to a proprietary enhancement of the standard. PCMCIA is discussing a 32-bit extension to the PC Card design, but as yet no timetable has been set for developing it.

Twenty-six address lines are used, allowing the direct addressing of up to 64MB of data. The memory areas on each card are independent. That is, each PC Card can define its own 64MB address range as its Common Memory. Not all of this memory range is directly addressable by some hosts: 8088-based systems are limited by their microprocessors to 1MB of directly addressed memory, for example. The entire 64MB range can be addressed by such systems through a PCMCIA window, however.

In addition to Common Memory, each card has a second 64MB address space

devoted to the Attribute Memory that holds the card's setup information. The entire range need not have physical memory associated with it. In fact, most PC Cards will likely devote only a few kilobytes of the available addressing range to CIS storage.

Activating the Register Select signal (pin 61) shifts the 26 address lines normally used to address Common Memory to specifying locations in Attribute Memory instead. The address space assigned to Attribute Memory need not correspond to a block of memory separate from Common Memory. To avoid the need for two distinct memory systems, a PC Card can be designed so that activating the Register Select signal simply points to a block of Common Memory devoted to storing setup information. All

Memory-Only Card Interface

1 of 2				
PIN	SIGNAL	I/O	FUNCTION	+/-
1	GND		Ground	
2	D3	I/O	Data bit 3	
3	D4	I/O	Data bit 4	
4	D5	I/O	Data bit 5	
5	D6	I/O	Data bit 6	
6	D7	I/O	Data bit 7	
7	CE1	I	Card Enable	-
8	A10	I	Address bit 10	
9	OE	I	Output Enable	-
10	A11	I	Address bit 11	
11	A9	I	Address bit 9	
12	A8	I	Address bit 8	
13	A13	I	Address bit 13	
14	A14	I	Address bit 14	
15	WE/PGM	I	Write Enable	-
16*	RDY/BSY	O	Ready/Busy	+/-
17	Vcc			
18*	Vpp1		Programming Supply Voltage 1	
19	A16	I	Address bit 16	
20	A15	I	Address bit 15	
21	A12	I	Address bit 12	
22	A7	I	Address bit 7	
23	A6	I	Address bit 6	
24	A5	I	Address bit 5	
25	A4	I	Address bit 4	
26	A3	I	Address bit 3	
27	A2	I	Address bit 2	

Figure 3: These are the pin assignments for a memory card. Asterisks indicate the 10 assignments that differ between memory cards and I/O cards. Active "low" signals are shown by a - (minus sign); active "high" signals are shown by a + (plus sign).

Memory-Only Card Interface

2 of 2

PIN	SIGNAL	I/O	FUNCTION	+/-
28	A1	I	Address bit 1	
29	A0	I	Address bit 0	
30	D0	I/O	Data bit 0	
31	D1	I/O	Data bit 1	
32	D2	I/O	Data bit 2	
33*	WP	O	Write protect	+
34	GND		Ground	
35	GND		Ground	
36	CD1	O	Card detect	-
37	D11	I/O	Data bit 11	
38	D12	I/O	Data bit 12	
39	D13	I/O	Data bit 13	
40	D14	I/O	Data bit 14	
41	D15	I/O	Data bit 15	
42	CE2	I	Card Enable	-
43	RFSH	I	Refresh	
44*	RFU		Reserved	
45*	RFU		Reserved	
46	A17	I	Address bit 17	
47	A18	I	Address bit 18	
48	A19	I	Address bit 19	
49	A20	I	Address bit 20	
50	A21	I	Address bit 21	
51	Vcc			
52*	Vpp2		Programming Supply Voltage 2	
53	A22	I	Address bit 22	
54	A23	I	Address bit 23	
55	A24	I	Address bit 24	
56	A25	I	Address bit 25	
57	RFU		Reserved	
58	RESET	I	Card Reset	+
59	WAIT	O	Extend bus cycle	-
60*	RFU		Reserved	
61*	REG	I	Register select	-
62*	BVD2	O	Battery voltage detect 2	
63*	BVD1	O	Battery voltage detect 1	
64	D8	I/O	Data bit 8	
65	D9	I/O	Data bit 9	
66	D10	I/O	Data bit 10	
67	CD2	O	Card detect	-
68	GND		Ground	

PC Cards limit access to Attribute Memory to an 8-bit link using the eight least-significant data lines.

To open or close access to data read from a PC Card, the host computer activates a signal on the card's Output Enable line (pin 9). A Ready/Busy line (pin 16) on memory cards allows the card to signal when it is busy processing and can-

not accept a data transfer operation. The same pin is used on I/O cards to make interrupt requests to the host system. During setup, however, an I/O card can redefine pin 16 back to its Ready/Busy function. Under Release 2.0, memory or I/O PC Cards can also delay the completion of an operation in progress—in effect, slowing the host to accommodate the time needs of the card—by activating an Extend Bus Cycle signal on pin 59.

The Write Protect pin (pin 33) relays the status of the write-protect switch on memory cards to the computer host. On I/O cards, this pin serves to indicate that a given I/O port has a 16-bit width.

Pins 62 and 63 on memory cards output two battery status signals. Pin 63 indicates the status of the battery: When activated, the battery is in good condition; when not activated, it indicates that the battery needs to be replaced. Pin 62 refines this to indicate that the battery level is sufficient to maintain card memory without errors; if this signal is not activated, it indicates that the integrity of on-card memory may already have been compromised by low battery power.

Memory cards that use EPROM memory often require higher than normal voltages to reprogram their chips. Pins 18 and 52 on the PCMCIA interface provide these voltages when needed.

The same 26 lines used for addressing Common and Attribute Memory serve as port selection addresses on I/O cards. Two pins, I/O read (44) and I/O write (45) signal that the address pins will be used for identifying ports and whether the operation is a read or a write.

Unlike memory addresses, however, the I/O facilities available to all PC Cards in a system share “only” one 67,108,864-byte (64MB) range of port addresses. Considering that the AT bus allows only 64K of I/O ports, of which some systems recognize a mere 16K, the shared port address space represents no real limitation. Even assigning 16K ports to each of the 4,080 possible PC Cards in a system would leave a few port addresses unused. Whether ports are 8- or 16-bit is indicated by the signal on pin 33.

I/O PC Cards each have a single interrupt request signal. The signal is mapped to one of the PC interrupt lines by the computer host. That's to say, the PC Card generates a generic interrupt and it is the

host computer's responsibility to route the interrupt to the appropriate channel.

The PCMCIA specification requires all PC Cards to be able to generate edge-triggered (PC and AT-style) interrupts and level-sensitive interrupts (as used by Micro Channel and EISA in some modes). Every card conforms to the host's requirements.

An audio output line is also available from I/O PC Cards. This connection is not intended for high-quality sound, however, for it allows only binary digital (on/off) signals. The audio lines of all PC Cards in a system are linked together by an XOR (exclusive OR) logic gate that is fed to a single common loudspeaker.

PC Card, Release 2.0, adds a single Reset signal to all cards at pin 58. When the host computer activates this signal, the card returns to preinitialization settings, with I/O cards returning to their power-on memory card emulation.

PCMCIA 2.0 contemplates the use of PC Cards that operate at either the standard TTL 5-volt level or at a power-saving reduced voltage level of 3.3. The current standard requires that cards initialize operating at 5 volts then shift to lower voltage operation under the direction of the card's configuration information. PCMCIA is currently working on extending the standard to embrace PC Cards that operate solely at 3.3 volts.

Besides the efforts at extending PCMCIA to future technologies such as 32-bit data paths and bus mastering, PCMCIA is also developing standards for incorporating specific device types into the system. Already the group has fully described the needs for XIP, which allows programs to execute from their storage locations on PC Cards instead of needing to be loaded as if from disk into normal system RAM. PCMCIA has also developed standards for linking AT Attachment-style IDE hard disks into PC Card sockets.

As the storage and expansion needs of PCs and other electronic devices continue to evolve, the PCMCIA PC Card standard will likely follow in lockstep. Undoubtedly it's the PC expansion system of the future—and the first truly universal data interchange system. □

WINN ROSCH IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

Bring Variety to Your Windows Desktop with CHANGER

BY DOUGLAS BOLING

Even Windows' brightest colors, most interesting wallpaper, most provocative desktop pattern, and wildest screen saver can become boring if you stare at them often enough. To avert such visual burnout, CHANGER, this issue's utility, lets you give your Windows 3.1 desktop a different look every time you bring it up.

CHANGER lets you choose from among the various wallpapers, color schemes, desktop patterns, and screen savers Windows provides (or that you may have added), and you can limit CHANGER's choices in each of the four categories. If you like only the "Flying Windows" and "Rockets" screen savers, you can tell CHANGER to select between those two only. Indeed, if you don't use a wallpaper or desktop pattern at all, you can tell CHANGER to ignore those (or any) particular categories.

You can also configure CHANGER to present your chosen selections in sequence. If you want to use a specific color scheme for each day of the week, simply choose your five favorite combinations (seven if you're self-employed) and select CHANGER's sequential change option. If you'd rather take your chances, you can have CHANGER make any or all of its category choices at random.

Because CHANGER uses some of the function calls that are new in Windows 3.1, a dialog box indicating that a newer version of Windows is required will pop up if you try to run the utility under Windows 3.0.

You can download the executable file and all the source files necessary for compiling CHANGER from the Utilities/Tips forum on PC MagNet, archived as CHANGE.ZIP. (See the sidebar "Utilities by Modem" for instructions.)

To recompile the program after mak-

ing changes of your own, you'll need either the Borland C++ 3.1 compiler or Microsoft C 6.0 compiler and the Windows SDK.

If you don't have a modem, you can get the files by sending a postcard with your name, address, and disk preference to the attention of Katherine West, *PC Magazine*, One Park Ave., New York, NY 10016. Or just fax your request to 212-503-5799. No phone calls, please!

USING CHANGER It takes only a few minutes to install and configure CHANGER; thereafter it will run automatically. To install the utility, open the

*Colors, Wallpapers,
Desktop Patterns, and
Screen Savers can all be
changed in nearly every
imaginable way with
this handy utility.*

Startup Group in your Program Manager. Select the File | New menu item and then choose Program Item. As the Description, fill in the title of the program as you want it to appear under the icon. Then, on the command line, enter the complete path and executable filename, followed by /C. The /C command line switch tells CHANGER to change the desktop per your configuration instructions and then terminate.

Thus, if you keep CHANGER in your PCMag directory on your C: drive, you would enter

C:\PCMAG\CHANGER /C

on the command line.

To configure CHANGER, just run CHANGER using the File | Run menu selection in the Program Manager, but *without* the /C switch. When you start CHANGER without the /C parameter, it displays a dialog box with 4 choices: Colors, Wallpaper, Screen Saver, and Desktop Pattern, as shown in Figure 1.

To select a category, just double-click on its icon or select Configure. Keyboard users can use hotkeys (Ctrl-C for Colors, Ctrl-W for Wallpaper, Ctrl-S for Screen Savers, Ctrl-P for Patterns) instead. (If you make frequent changes to your CHANGER configuration, you might want to add a CHANGER Icon to the Program Manager that omits the /C on the command line. This will allow you quick access to the CHANGER configuration dialog.)

When you select a category, CHANGER brings up a dialog box with two list boxes and a number of buttons. The first list box contains all possible selections for that category. The second list box (initially empty) contains the set of selections from which you want CHANGER to pick. The Add, Rem (Remove), Add All, and Rem All (Remove All) buttons let you move selections back and forth between the list boxes.

For example, when configuring the Colors category, CHANGER presents a list that contains both the color combinations predefined by Windows and those you may have created. To add a given color scheme to the list of active selections, just select that scheme in the list box and click on the Add button. (If you like shortcuts, double-clicking on an item will add it to the active list.)

CHANGER will remove that combination from the Possible list and place it in the Active list. To remove a color scheme from the Active list, double-click on the item or select that item and press the Rem button. The Add All and Rem

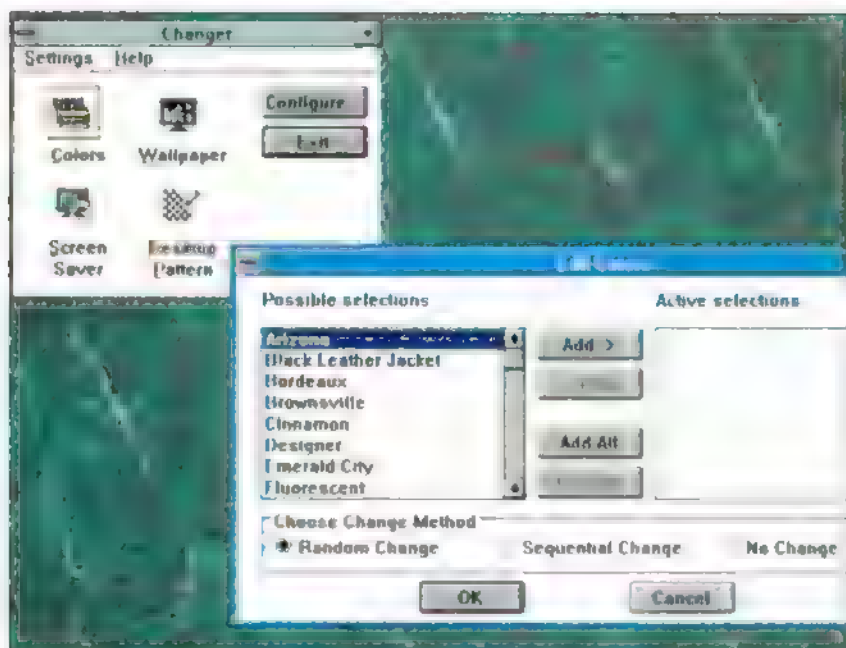


Figure 1: You can configure CHANGER to display various color schemes, wallpapers, screen savers, and patterns randomly or sequentially.

All buttons give you a quick way to move all selections between the list boxes.

Below the Possible and Active list boxes, the Configure dialog box contains three radio buttons. The Random Change button tells CHANGER to select an item at *random* from the Active list each time you start Windows. Selecting Sequential Change tells CHANGER to select an item *sequentially* from the Active list each time you start Windows. The No Change button tells CHANGER not to change that particular category. After you specify your configuration, click on the OK button to save your changes; the Cancel button tells CHANGER to ignore your changes.

EXPLORING THE WINDOWS DESKTOP

How does Windows know which color pattern, wallpaper, and screen saver to use when it starts? WIN.INI and SYSTEM.INI, the most important of the .INI files, store a variety of settings for such things as the position of windows, the type of video driver to load, and—you guessed it—the colors settings, wall paper, and screen saver used by Windows.

The .INI files are organized into sections whose names are enclosed in square brackets. Within each section there are usually several *keys* (key words), each of which is set equal to a value. For example, the WIN.INI file has a section called [Desktop] that includes Pattern, IconSpacing, and Wallpaper keys. Figure 2 is a partial listing of my own WIN.INI file, showing the [Desktop] and the [Colors] sections.

The [Colors] section specifies the color settings for every part of Windows,

from backgrounds to button text. The value for each key is a set of three numbers, separated by spaces, that represent the Red, Blue, and Green components that are combined to produce the color. On my system, the color of the title bar for the active window is specified by the following line:

```
ActiveTitle=64 128 128
```

In this line, 64 represents the value of the Red component, 128 is the value of the Green component, and the final number, 128, is the value of the Blue

component. The amounts of each component may range from 0 to 255, with 0 indicating that none of that color is added and 255 meaning that the maximum amount of that primary color is added.

If you're used to thinking in artistic terms, calling Red, Green, and Blue "primary colors" may come as a surprise. When using paints or pigments, the three primary colors are Red, Blue, and Yellow. The explanation is that paints *absorb* the different wavelengths of light while the rays that come from the sun or that illuminate a computer monitor *are* light, whose red, green, and blue components, added together in maximum amounts, produce white. Other combinations of the three primaries produce other colors: red and green make yellow, blue and green produce cyan, and so on.

If you look at the individual colors specified in the WIN.INI file, however, something seems to be missing. When you use the Control Panel to change your desktop color scheme you see *names*, such as Arizona, Pastel, or—strangely enough—Hotdog Stand. Each of these represents a numeric color combination. Selecting Pastel, for instance, changes the entire desktop into a rainbow of subdued blues, greens, and yellows.

The translation table between the names and numbers is contained in the [Color Schemes] section of the CONTROL.INI file. Here, each of the color combinations consists of a series of 21 numbers that represent all of the individual color settings used by Windows. Unlike the color values listed in the WIN.INI file, however, these numbers are in hexa-

decimal (base 16) format and are separated by commas. For example, the Pastel key in my CONTROL.INI file is

```
Pastel=C0FF82,80FFFF,FFFFFF,0,
FFFFFF,0,FFFF80,FFFFFF,0,C080FF,
FFFFFF,808080,C0C0C0,C0C0C0,
808080,0,C0C0C0,FFFF00,0,0,FFFFFF
```

Each of these hexadecimal numbers represents the setting for a particular color. The first number is the Background color, the second is the Application Workspace color, and so on. When you select the Pastel setting from the Control Panel, Windows takes the colors listed and translates them into the color settings in the WIN.INI file. For example, the starting number C0FF82 would be broken into three hexadecimal numbers—C0 FF 82—which translate into the decimal values 192 255 130, which are then used to set the Background color. In the WIN.INI file the line would read

```
Background=130 255 192
```

The Desktop Pattern is the little design that Windows uses when it draws the desktop window. To get an idea of the different desktop patterns, open the Desktop Control Panel applet, select

WIN.INI

Partial Listing

```
[Desktop]
Pattern=136 84 34 69 136 21 34 81
TileWallpaper=1
GridGranularity=0
IconSpacing=65
Wallpaper=SQUARES.BMP

[Colors]
Background=0 64 128
AppWorkspace=192 192 192
Window=192 192 192
WindowText=0 0 0
Menu=192 192 192
MenuText=0 0 0
ActiveTitle=64 128 128
InactiveTitle=192 192 192
TitleText=255 255 255
ActiveBorder=128 0 0
InactiveBorder=130 130 130
WindowFrame=0 0 0
Scrollbar=128 128 128
ButtonFace=192 192 192
ButtonShadow=128 128 128
ButtonText=0 0 0
GrayText=192 192 192
Highlight=0 0 0
HighlightText=255 255 255
InactiveTitleText=0 0 0
ButtonHighlight=255 255 255
```

Figure 2: A partial WIN.INI file, showing the [Desktop] and [Colors] sections and the keys listed in both.

(none) for the Wallpaper, choose one of the many patterns listed, and click OK. You'll see the selected pattern tiled across your Windows desktop. You can then check out the different available patterns, or you can even make one of your own by clicking on the Edit Pattern button. Unfortunately, if you tile your wallpaper, as I do, you'll only see the desktop pattern as the background of the icon text on the bottom of the screen.

The pattern is actually a bitmap that Windows creates from a series of numbers. The numbers represent an 8- by 8-pixel bitmap that tells Windows to use either the Background color (a 0-bit in the pattern) or the WindowText color (a 1-bit in the pattern) for each specific pixel. The pattern is repeated across the entire screen to draw the desktop.

An example may make this clearer. One of the available patterns, called Tulip, is represented by the numbers 0 0 84

124 124 56 146 124. Each of these numbers represents one 8-bit line in the bitmap. If you write each of the numbers on a separate line and in binary, the tulip pattern formed by the 1 bits will become evident, as shown in Figure 3.

As with the window colors, the current pattern is specified by the eight numbers assigned to the Pattern key in the [Desktop] section of the WIN.INI file (see Figure 2). As with the color combinations, the names of the possible patterns (Tulip, Weave, Boxes, and so on) are listed in the CONTROL.INI file, together with their 8-number values. If you use the Control Panel to create your own pattern, its key and values will also be written into the [Patterns] section of CONTROL.INI. If you don't specify a pattern, the string (none) will be assigned to the Pattern key.

Wallpaper is a bitmap picture that Windows uses to cover the desktop. The

The Tulip Desktop Pattern

```

0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 1 0 1 0 1 0 0
0 1 1 1 1 1 0 0
0 1 1 1 1 1 0 0
0 0 1 1 1 0 0 0
1 0 0 1 0 0 1 0
0 1 1 1 1 1 0 0

```

Figure 3: The Desktop Pattern is formed by repeating patterns of 8 by 8 pixels. With this pattern shown in binary form, the outline of the tulip is apparent.

picture can be centered in the desktop or it can be "tiled," by repeating the bitmap so that it covers the entire screen. (To tile a 64- by 64-pixel bitmap on a 1,024-by-768 screen, Windows must repeat the bitmap 192 times.) Unlike the bitmap used to make the Desktop pattern, the wallpaper picture is stored as a bitmap (.BMP) file and can be in color.

Instead of specifying numbers, as with the Colors and Pattern settings, the Wallpaper key in the [Desktop] section of WIN.INI contains the filename of the bitmap to be used for the wallpaper. Also unlike the Colors and the Pattern, the names of other possible Wallpaper bitmaps are not stored in the CONTROL.INI file. Instead, the Control Panel lists all the .BMP files in the Windows and Windows System directories as possible wallpaper files. Thus, when you select a wallpaper bitmap, Windows simply sets the Wallpaper key in [Desktop] to the name of the bitmap file.

The Windows Screen Saver was one of the new features added to Windows 3.1. In reality, Microsoft simply bundled the screen-saver application from the old Multimedia Windows, moving its setup from the screen-saver applet in the Control Panel to the Desktop applet. Once set, Windows automatically starts the screen saver after a predetermined period of machine inactivity.

Screen savers are not bitmaps, but program files. The selected screen saver is specified in the [Boot] section of the SYSTEM.INI file, as the value for the SCRNSAVE.EXE key. Although the Screen Saver line can include a path to

■ Utilities by Modem

The *PC Magazine* utilities are available by modem from PC MagNet, a ZiffNet service hosted by CompuServe.

To find the phone number nearest you, set your communications software to 300, 1,200, 2,400, or 9,600 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex, then dial 800-346-3247 with your modem.

When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. Or you can call 800-635-6225 (voice) and follow the instructions and note the number.

To obtain the current issue's utility free of charge: Dial the local number; at the HOST NAME prompt, type CIS, and at the USER ID prompt, enter 60116,1. Then at the PASSWORD prompt, enter PCMAG-UTIL.

To join ZiffNet: At the USER ID prompt, type 177000,5000. Then, at the PASSWORD prompt, enter PC* MAGNET. Finally, at the ENTER AGREEMENT NUMBER prompt, type PCMAG92.

Register your name and enter your American Express, MasterCard, or Visa number. (If you'd like to have your company billed instead, simply call CompuServe at 800-848-8990.) Your personal user ID and a temporary password will be displayed. A new password will arrive in the mail within ten days to confirm your subscription.

ZiffNet membership costs \$2.50 per month. This includes access to *PC Magazine* Editors' Choice Awards, Product Reviews index, Weekly News from *PC Week*, Buyers' Market, ZiffNet Highlights, and the Support Forum (which also includes the current utility). CompuServe members can join by entering GO PCMAG at any CompuServe ! prompt.

Outside of these areas, PC MagNet costs \$6.30 per hour for 300-bps service, \$12.80 for 1,200 or 2,400 bps, and \$22.80 for 9,600 bps. Billing is based on 1-minute increments.

These programs can be copied but are copyrighted. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

another directory, screen savers are normally kept in the Windows directory, the Windows System directory, or the directory of the Control Panel application, since these are the only places the Control Panel knows to look for them.

At the same time that the Control Panel stores the screen-saver filename and path in SYSTEM.INI, two lines in the WIN.INI file are also modified. The ScreenSaveTimeout and ScreenSaveActive keys in the [Windows] section of WIN.INI are updated to indicate that a screen saver is active and the time to elapse before it becomes active.

If you look at the list of screen savers presented by the Control Panel's Desktop applet, you won't see a list of the usual eight-character filenames. Instead, you'll see descriptive screen-saver designations that include upper- and lower-case characters and even spaces. This is because the Desktop applet doesn't use the filename of the screen saver; rather, it reads the description line imbedded inside the screen-saver program to get the name of the screen saver. This enables Windows to present you with nice descriptive names from which to choose while storing the actual filename of your choice in the SYSTEM.INI file.

HOW CHANGER WORKS Having seen how Windows saves the settings for each of the four categories, it's time to consider how CHANGER modifies them. The CHANGER functions fall into two parts: the code that allows the user to configure CHANGER, and the code that actually changes the desktop. I'll follow this division in discussing CHANGER's code.

When started without any command line parameters, CHANGER displays the main window, which is a nonmodal dialog box. The dialog box contains four

icons, each representing one of the categories CHANGER can modify. Each icon has two additional associated controls. The first is a static text control, which is used to display the name of the category under the icon. The other static control, a black rectangle frame, indicates the selected category. Only one of the four rectangle controls is visible at any given time; the default location is the Colors category.

When the user clicks on the dialog box, CHANGER checks to see whether the click occurred over one of the text or rectangle controls other than the default. If so, CHANGER hides the previously visible rectangle and makes the rectangle control that surrounds the clicked icon visible. If the user presses the Configure button, CHANGER checks which icon is selected and launches the Configure dialog box so the user can edit the category associated with that icon.

If the user double-clicks on an icon, the CHANGER window receives two messages in sequence, a WM_LBUTTONTODOWN and a WM_LBUTTONDOWNBLCLK. The former selects the icon in question. When CHANGER receives a double-click message it simply sends a WM_COMMAND message to itself to "fake" a click of the Configure button.

The Configure dialog box lets the user select which choices CHANGER will use when changing the desktop. The interesting thing to note here is that the same code is used for all four categories. The only change made for each category is the method used to fill in the list of possible selections. I'll start by describing how the Configure dialog box works for the Color category. The variations for the other categories can be deferred until later.

As discussed above, the possible Color schemes are listed in CON-

TROL.INI. When the Configure dialog box is launched, CHANGER passes the name of the category (in this case, Color) to be edited. The dialog box code then looks in a section named for that category in the CHANGER.INI file to determine where the list of possible selections is to be found. Thus, when the Colors category is edited, the keys SrcINI and SrcCat in the [Colors] section of CHANGER.INI are read. These yield the name of the .INI file, CONTROL.INI, and the section, [Color Schemes], respectively. The routine then reads all keys in the [Color Schemes] section of the CONTROL.INI file and places them into the list box of Possible Selections.

To read data from an .INI file, a program has only to specify the section, key, and name of the .INI file, and the Windows GetPrivateProfileString API function will return the data. The problem here is that CHANGER doesn't know what keys might reside in the [Color Schemes] section. While most users will no doubt have the Wingtips and Paisley keys, for example, CHANGER must also be able to retrieve any keys the user may have added. Fortunately, Windows provides an answer. If a program calls GetPrivateProfileString with a null pointer passed in place of a pointer to the key name, Windows returns a list of *all* keys in the section specified.

While discovering the names of each of the keys is important, it is also necessary to keep track of the values associated with each of the keys. After all, it is the data that must be used to change the actual colors. Thus CHANGER uses the color scheme names to identify them for the user, but it uses the key data to make the color changes.

When a key is placed in the Possible list box, CHANGER combines the name

The WriteActiveGeneric Routine

```
//-----
// WriteActiveGeneric Writes a list for generic selection
//-----
void WriteActiveGeneric (HWND hwnd, WORD vLBID, char * szcategory) {
    char szCat[64];
    char * pszTemp;
    int i, sCnt;
    // Delete current keys in section
    //
    strcpy (szCat, szCurcategory);
    strcat (szCat, " Active");
    WritePrivateProfileString (szCat, 0, "", szProfileName);
    // Get and save count of keys in list box
    //
    sCnt = (int) SendDlgItemMessage (hwnd, IDD_SELECT, LB_GETCOUNT,
    0, 0);
    itoa (sCnt, szBuffer, 10);
```

```
WritePrivateProfileString (szCurcategory, "Count",
    szBuffer, szProfileName);
// Loop. Write each key in listbox to active section.
//
for (i = 0; i < sCnt; i++) {
    SendDlgItemMessage (hwnd, vLBID, LB_GETTEXT, i,
    (LPARAM) (LPSTR) szBuffer);

    pszTemp = strchr (szBuffer, '\t');
    if (pszTemp != 0) {
        *pszTemp = 0;
        WritePrivateProfileString (szCat, szBuffer,
        pszTemp+1, szProfileName);
    }
}
return;
```



Figure 4: The WriteActiveGeneric routine reads the list of active selections and writes them to the CHANGER.INI file.

ChangeDesktop and ChangeGeneric

```

-----
ChangeDesk - Changes the desktop parameters
-----
void ChangeDesktop (void)
{
    char    szSelection[32], szData[128];
    char *   pszBuffer;
    int      i;

    i = (int) GetPrivateProfileString ("categories", 0, "None", szBuffer,
                                      sizeof (szBuffer), szProfileName);
    if (i == 0 || strcmp (szBuffer, "None") == 0)
        return;

    pszBuffer = szBuffer;
    i = 0;
    while (*pszBuffer != 0) {
        switch (GetPrivateProfileInt (pszBuffer, "Type",
                                     -1, szProfileName)) {
            case 0: //Colors
                ChangeColors (pszBuffer);
                break;

            case 2: //Screen Saver
                ChangeGeneric (pszBuffer);
                break;

            case 3: //Pattern
                if (!GetNextActive (pszBuffer, szSelection, szData)) break;
                SystemParametersInfo (SPI_SETDESKPATTERN, 0, szData,
                                     SPI_UPDATEINIFILE |
                                     SPI_SENDWININICHANGE);
                break;

            case 1: //Background
                if (!GetNextActive (pszBuffer, szSelection, szData)) break;
                SystemParametersInfo (SPI_SETDESKWALLPAPER, 0, szData,
                                     SPI_UPDATEINIFILE |
                                     SPI_SENDWININICHANGE);
                break;

            default:
                ChangeGeneric (pszBuffer);
                break;
        }
        for (; *pszBuffer != 0; pszBuffer++)
            pszBuffer++;
    }
    return;
}

-----
ChangeGeneric - Changes a parameter from an INI file
-----
void ChangeGeneric (char * szCategory,
                  char szSelection[32], szDestCat[32], szDestItem[32], szDestIni[32];
                  char szData[128])
{
    GetPrivateProfileString (szCategory, "DestIni", "None", szDestIni,
                            sizeof (szDestIni), szProfileName);
    GetPrivateProfileString (szCategory, "DestCat", "None", szDestCat,
                            sizeof (szDestCat), szProfileName);
    GetPrivateProfileString (szCategory, "DestItem", "None", szDestItem,
                            sizeof (szDestItem), szProfileName);

    if (!GetNextActive (szCategory, szSelection, szData)) return;

    WritePrivateProfileString (szDestCat, szDestItem, szData,
                              szDestIni);

    return;
}

```



Figure 5: The ChangeDesktop and ChangeGeneric routines combine to do most of the work that changes the look of the desktop.

of the key with the data for that key. As each key is read, a tab character is appended to the name of the key and it is then combined with the data for that key. In the case of the Wingtips key, for example, its data

```

408080,C0C0C0,FFFFFF,0,FFFFFF,0,
818181,FFFFFF,FFFFFF,4080,FFFFFF,
3,818181,C0C0C0,808080,0,FFFFFF,
3,FFFFFF,0,FFFFFF

```

is appended to make the string

```

wingtips TAB 408080,C0C0C0,
FFFFFF,0,FFFFFF,0,808080,
FFFFFF,FFFFFF,4080,FFFFFF,0,
818181,C0C0C0,808080,0,FFFFFF,
3,FFFFFF,0,FFFFFF

```

The string is then added to the list box.

When the Configure dialog box is started, the list boxes are initialized so that the first tab stop is set to 100 dialog box units; that is, to the width of 25 average characters. The tab character ensures that the data section of the string (which resides beyond the tab) is pushed beyond the right side of the list box, and so is out of sight of the user.

Once the list of possible selections is filled in, CHANGER fills in the current list of active Color Schemes. The active list is kept in the CHANGER.INI file in a section called [Colors Active]. To read

the list, CHANGER uses the GetPrivateProfileString function to read every key in the section for that category. The Active list is filled in the same Name<TAB>Data format as was used for the Possible list. After both list boxes have been filled, their contents are compared, and keys that are in the Active list are removed from the Possible list.

When the user selects a Color Scheme from the Possible list box and clicks on the Add button, CHANGER adds that key to the Active list box and deletes it from the Possible list box. The action of the Remove button is just the opposite. When the OK button is clicked, CHANGER calls its WriteActiveGeneric routine to save the list of active selections. Figure 4 lists the code for this procedure.

The first action of WriteActiveGeneric is to delete all keys from the [Color Active] section in CHANGER.INI. This purging ensures that no keys remain that might have been deleted by the user. CHANGER then reads each key from the Active list box. As each key is read, the name is separated from the data by replacing the tab character with a zero. This creates two ASCIIZ strings, one with the name of the key and one with the key value. The WritePrivateProfileString Windows function is then used to write the key and its value to the CHANGER.INI file. When this process

is complete, the [Colors Active] section in the CHANGER.INI file contains an updated list of all color schemes the user wants CHANGER to use. The dialog box is then closed and CHANGER returns to its main window.

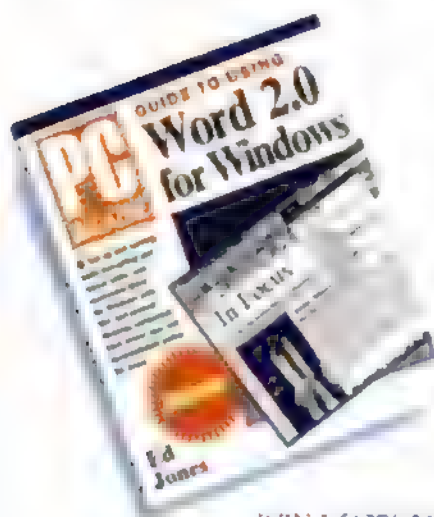
The process for configuring the other three categories, Patterns, Wallpaper, and Screen Savers, is similar to the process for Colors. For all categories, the same Configuration dialog box template and procedure are used. The only difference is the specific method for filling in the list of Possible selections. Even here, all categories use the Name<TAB>Data format to fill in the list box itself.

Once configured, each category has its own Active section in CHANGER.INI and each contains a list of the selections from which the user wants CHANGER to choose when the desktop is changed.

CHANGING THE DESKTOP Having seen how CHANGER creates the list of active selections, I can turn to how CHANGER actually goes about changing the desktop. CHANGER is unusual among Windows programs in that when the /C switch is used no window is created and the standard GetMessage Dispatch Message loop is not used. Instead, a routine called ChangeDesktop is called.

ChangeDesktop calls two routines, ChangeDesktop and ChangeGeneric, to change the desktop. These are both listed in Figure 5. ChangeDesktop reads a list

Step Up to Word for Windows.



ISBN 1-56276-030-0
\$27.95

Step up to professional-quality documents with *PC Magazine Guide to Word 2.0 for Windows*. Best-selling author Ed Jones is a recognized master of the step-by-step writing style, which means quick learning with minimum effort. Crystal-clear explanations and dozens of generously illustrated examples will guide you from everyday typing and formatting right up through form letters, envelopes, tables, and even desktop publishing—all the supercharged features that are making Word 2.0 for Windows the emerging choice among Windows word processors.

Available
at fine
bookstores,
or call

1-800-688-0448
ext. 1230



© 1992 Ziff-Davis Press

PC Magazine Utilities Updates

As with all good software, the programs presented in *PC Magazine* are upgraded and improved. Here's a partial list of the programs on PC MagNet that have been updated. To download these files from the Utilities/Tips Forum, type GO ZNT:TIPS, type LIB or select Libraries from the menu, then select Library 2 PCMAG UTILS. Type DOW and the filename listed below (for example, DOW ANSI.COM), or select Download a File from the menu.

ADDIT.COM, Version 1.1
ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.5
BCOPY, Version 1.2
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.7
CONFIG.CTL, Version 3.0
DIRMATCH.COM, Version 3.1

EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
PCACCESS.EXE, Version 1.1
RN.COM, Version 3.0
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
ZCOPY.COM, Version 1.4

For a list of the programs that are available on PC MagNet, download the file PCMCAT.ZIP from Library 1 (General Info) of the Utilities/Tips Forum.

A downloadable index to *PC Magazine's* product reviews is also available in Library 1 (General Info). PCM.EXE is a self-extracting file containing the Computer Library *PC Magazine* Reviews Index for January 1988 through December 1991. It requires the search files in PCSRCH.EXE.

of the categories to change from the [Categories] section of the CHANGER.INI file. For each category, there is a Type key that determines how to change that specific category. The Pattern, Wallpaper, and Screen Saver fall into a general Type category that can be changed by calling the ChangeGeneric routine.

When the ChangeGeneric procedure is called, it reads the relevant category section of CHANGER.INI. In this way it determines the Section name, Key name, and even the name of the .INI file to modify for the affected category. This information is then used in conjunction with the new active data determined by GetNextActive (another CHANGER routine) to modify the necessary .INI file.

Changing the Colors is a bit more complex, so there is a specific routine, ChangeColors, that modifies the color settings. As described earlier, the color combinations are stored in a format that saves the 21 colors in hexadecimal format. ChangeColors must separate each of these 21 color numbers, change them into a 3-number decimal format, and then assign each value to the appropriate color key in WIN.INI. Once the colors have been updated in WIN.INI, the Windows API function SetSysColors is called to

produce the color change immediately.

When CHANGER modifies the Pattern and Wallpaper categories, calls are made to the Windows API function SystemParametersInfo to update the desktop. This function, which is new to Windows 3.1, can either set or query a number of settings, including Desktop Wallpaper, Pattern, Screen Saver Timeout, and Screen Saver Active. CHANGER calls this routine once for each of the three noncolor categories to make the appropriate changes. Once all of the desired categories have been changed, CHANGER terminates.

CHANGER provides an interesting look into how Windows remembers its settings from one day to the next. The WIN.INI, SYSTEM.INI, and CONTROL.INI files are powerful components of the standard Windows system. More information about .INI file settings and a host of other programming-relevant matters is contained in the almost-indispensable Windows Resource Kit manual. And even if you don't give a whit about how Windows works on the inside, CHANGER provides something even more important: variety. □

DOUGLAS BOLING IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

Working with OS/2 Bitmap Fonts

BY CHARLES PETZOLD

Outline fonts are wonderful. Because the characters in an outline font are defined by straight lines and curves, they are continuously scalable and can be manipulated like other graphics objects. Outline fonts can be rotated and skewed, and the outlines can even define clipping regions. These fonts solve the long-frustrating problem of device dependency by being renderable on every type of output device.

Back in the days of OS/2 1.1, the Presentation Manager supported a collection of outline fonts, but they weren't very satisfactory. The outlines were only outlines, without the hints required to make small point sizes readable on medium-resolution devices such as video displays. And these old OS/2 fonts were not cached in memory as rasterized bitmaps, resulting in poor performance.

Since OS/2 1.3, however, PM has included the Adobe Type Manager, which supports Adobe Type 1 outline fonts. These fonts are hinted, and the rasterized bitmaps are cached in memory, solving both problems with the old PM outline fonts. So, is there any reason at all to use bitmap fonts?

Well, yes, actually. In fact, bitmap fonts give us the two things we value most when working with fonts on our PCs—performance and appearance.

Bitmap fonts are faster than outline fonts. Before an outline font can be used, the characters usually must be rasterized and the character bitmaps stored in memory. This takes time, even though the resultant bitmaps may be potentially as fast to display as bitmap fonts.

In theory at least, bitmap fonts can also look a little better on the screen. The characters in a bitmap font are individually designed for maximum legibility. This typically produces better results

than a general-purpose outline font that is scaled to a particular point size.

When approaching the subject of fonts under the OS/2 2.0 Presentation Manager, bitmap fonts are a good place to start because they inherently limit what you can do. You can use only the font sizes that are available, and you don't have many options, so you can ignore some parts of the font API.

One problem, of course, is that you can't use the bitmap fonts on printers. But for strictly screen-based text that

Bitmap fonts give us what we value most—performance and appearance. A sample program demonstrates basic functions for displaying text using OS/2 2.0's bitmap fonts.

doesn't require rotation or other special effects, bitmap fonts work just fine. So let's proceed.

THE BITFONTS PROGRAM The BITFONTS program shown in Figures 1 through 5 demonstrates some of the basic functions you use for selecting and displaying text using bitmap fonts.

Assuming you have OS/2 2.0 and the IBM C Developer's WorkSet/2 installed, you can create BITFONTS.EXE by running:

```
NMAKE BITFONTS.MAK
```

on an OS/2 command line. You can also download the source code and executable archived as BITFON.ZIP from the

Programming Forum on PC MagNet.

BITFONTS displays all the bitmap fonts available under OS/2 2.0, as shown in Figure 6. The character string displayed for each font consists of a space, the solid block character (ASCII code 0xDB), another space, the font face name and the point size, followed by another space, the solid block character, and a final space.

The Attribute menu allows you to select italics, an underscore, strikeout, and boldface. (For the sake of completeness, another option on this menu allows you to select outlined characters, but this doesn't work for bitmap fonts.) Figure 7 shows all four of these attributes applied to the fonts.

QUERYING THE BITMAP FONTS As I've discussed in previous columns, when you select a bitmap font for use in a Presentation Manager program, you must specify exactly the maximum baseline extent (usually about 120 percent of the point size) and the average character width of the font. If you don't specify them exactly, you'll end up with the default System Proportional font.

So you have a few options: You could hard-code the font sizes in your program. This is actually almost reasonable, because bitmap fonts are currently shipped for only four display resolutions: CGA, EGA, VGA, and 1,024-by-768 displays. There are 17 bitmap fonts, so that's only 68 pairs of numbers. But I don't recommend this: It could make your program incompatible with future display resolutions that might someday be supported under OS/2.

Another technique is to let your program loop through a range of baseline extents and average character widths when selecting fonts, and to take note of those that actually get something other than the default font. This would work, but I doubt you'd want to do it.

BITFONTS.MAK

Complete Listing

```

#-----
# BITFONTS.MAK make file
#-----

bitfonts.exe : bitfonts.obj bitfonts.def bitfonts.res
link386 /BASE:0x10000 bitfonts,, NUL,, bitfonts
rc bitfonts.res

bitfonts.obj : bitfonts.c bitfonts.h
icc -C -Kbcpr -Ss bitfonts.c

bitfonts.res : bitfonts.rc bitfonts.h
rc -r bitfonts.rc

```



Figure 1: This is the BITFONTS make file to use with the IBM C compiler.

The only practical approach is to query all the available fonts using the GpiQueryFonts function, and that's how BITFONTS does it. While processing the WM_CREATE message in ClientWndProc, the program obtains a presentation space handle for the client area and calls the GetAllBitmapFonts function.

GetAllBitmapFonts is somewhat similar to the GetAllFonts function in the FONTLIST program I presented in the December 8, 1992, column. The function first calls GpiQueryFonts to obtain the number of fonts available in the system, then allocates memory for two arrays of

FONTMETRICS structures sufficient to hold all the fonts. The function calls GpiQueryFonts a second time to obtain all the FONTMETRICS structures.

GetAllBitmapFonts wants only the bitmap fonts designed specifically for the video display currently in use. To exclude other bitmap fonts, the function calls DevQueryCaps with the CAPS_HORIZONTAL_FONT_RES and CAPS_VERTICAL_FONT_RES to get the font resolution of the display. For the VGA, these values are reported as 96 dots per inch.

The GetAllBitmapFonts function This function returns the value

then loops through all the fonts. It checks that the FM_DEFN_OUTLINE bit in the fsDefn field of the FONTMETRICS structure is not set (indicating a bitmap font), and that the sXDeviceRes and sYDeviceRes fields are equal to font resolution values returned from DevQueryCaps. If a font passes this test, it is copied to the second array of FONTMETRICS structures. The function concludes by freeing the first array, reallocating the second array to the number of bitmap fonts, and then returning the array and the number of bitmap fonts back to ClientWndProc.

Now ClientWndProc has an array of FONTMETRICS structures describing all the available bitmap fonts designed for the resolution of the video display.

CREATING THE LOGICAL FONT During the WM_PAINT message, BITFONTS displays all the fonts. The first step in using a particular font is to call GpiCreateLogFont to associate a font description with a number oddly called the *local ID*:

```

GpiCreateLogFont (hps, pName,
                  lcid, &fattns);

```

BITFONTS.C

1 of 2

```

/*-----
BITFONTS.C -- Displays OS/2 Bitmap Fonts
(c) Charles Petzold, 1993
-----*/

#define INCL_MIN
#define INCL_GPI
#include <os2.h>
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include "bitfonts.h"

#define LCID_FONT 1

HRESULT WINAPI ClientWndProc (HWND, ULONG, WPARAM, LPARAM);

int main (void)
{
    static CHAR szClientClass [] = "BitFonts";
    static ULONG flFrameFlags = FCF_TITLEBAR | FCF_SYSMENU | FCF_SIZEBOX | FCF_MINMAX | FCF_MAXIMIZE | FCF_TASKLIST | FCF_MENU;

    HNS hab;
    HMQ hm;
    HWND hwndFrame, hwndClient;
    QMSG qmsg;

    hab = WinInitialize (0);
    hm = WinCreateMsgQueue (hab, 0);

    WinRegisterClass (hab, szClientClass, ClientWndProc, CS_SIZEREDRAW, 0);

    hwndFrame = WinCreateStdWindow (HWND_DESKTOP, WS_VISIBLE,
                                   flFrameFlags, szClientClass,
                                   "Bitmap Fonts", 0L,
                                   NULLHANDLE, ID_RESOURCE, hwndClient);

    while (WinGetMsg (hab, &qmsg, NULLHANDLE, 0, 0))
        WinDispatchMsg (hab, &qmsg);

    WinDestroyWindow (hwndFrame);
    WinDestroyMsgQueue (hm);
    WinTerminate (hab);
    return 0;
}

LONG GetAllBitmapFonts (HPS hps, PFONTMETRICS * pfm)
{
    HDC hdc;
    LONG lAllFont, lBitFont, xRes, yRes;
    PFONTMETRICS pfmAll, pfmBit;

    // Find number of fonts
    lAllFont = 0;
    lAllFont = GpiQueryFonts (hps, QF_PUBLIC, NULL, &lAllFont, 0, NULL);

    if (lAllFont == 0)
        return 0;

    // Allocate memory for FONTMETRICS structures
    pfmAll = (PFONTMETRICS) calloc (lAllFont, sizeof (FONTMETRICS));

    if (pfmAll == NULL)
        return 0;

    pfmBit = (PFONTMETRICS) calloc (lAllFont, sizeof (FONTMETRICS));

    if (pfmBit == NULL)
    {
        free (pfmAll);
        return 0;
    }

    // Get all fonts
    GpiQueryFonts (hps, QF_PUBLIC, NULL, &lAllFont,
                  sizeof (FONTMETRICS), pfmAll);

    // Determine font resolution
    hdc = GpiQueryDevice (hps);
    DevQueryCaps (hdc, CAPS_HORIZONTAL_FONT_RES, 1, &xRes);
    DevQueryCaps (hdc, CAPS_VERTICAL_FONT_RES, 1, &yRes);

    // Get all the bitmap fonts
    lBitFont = 0;

    for (l = 0; l < lAllFont; l++)
    {
        if ((pfmAll[l].fsDefn & FM_DEFN_OUTLINE) &&
            pfmAll[l].sXDeviceRes == xRes &&
            pfmAll[l].sYDeviceRes == yRes)
        {
            pfmBit [lBitFont++] = pfmAll [l];
        }
    }
}

```



Figure 2: This is the source code for BITFONTS, a program that displays the OS/2 2.0 bitmap fonts.

BITFONTS.C

2 of 2

```

    }
    // Clean up
    free (pfmAll);
    pfmBit = (PFONMETRICS) realloc (pfmBit, lBitFnt * sizeof (PFONMETRICS));
    * pfm = pfmBit;
    return lBitFnt;
}

MRESULT EXPENTRY ClientWndProc (HWND hwnd, ULONG msg, WPARAM wpl, LPARAM wpl2)
{
    static BOOL    fItalic, fUnder, fOutline, fStrike, fBold,
                  fBaseline, fTextBox;
    static FATTRS  fat;
    static HWND    hwndMenu;
    static LONG    lFonts;
    static PFONMETRICS pfm;
    static SHORT    cyClient;
    static CHAR    szBuffer [FACESIZE + 32];
    static POINTL   ptl;
    static POINTL   ptl1 [TXTBOX_COUNT];

    switch (msg)
    {
        case WM_CREATE:
            // Get the array of FONMETRICS structures

            hps = WinGetPS (hwnd);
            GpiQueryFontAction (hps, QFA_PUBLIC);
            lFonts = GetAllBitmapFonts (hps, & pfm);
            WinReleasePS (hps);

            // Get menu window handle

            hwndMenu = WinWindowFromID (WinQueryWindow (hwnd, QW_PARENT),
                                         FID_MENU);

            return 0;

        case WM_SIZE:
            cyClient = HIUSHORT (wpl2);
            return 0;

        case WM_COMMAND:
            switch (COMMANDMSG (&msg) -> cmd)
            {
                case IDM_ITALIC:    fItalic = ! fItalic; break;
                case IDM_UNDERSCORE: fUnder = ! fUnder; break;
                case IDM_OUTLINE:    fOutline = ! fOutline; break;
                case IDM_STRIKEOUT:  fStrike = ! fStrike; break;
                case IDM_BOLD:       fBold = ! fBold; break;
                case IDM_BASELINE:   fBaseline = ! fBaseline; break;
                case IDM_TEXTBOX:    fTextBox = ! fTextBox; break;

                default: return 0;
            }

            WinCheckMenuItem (hwndMenu, COMMANDMSG (&msg) -> cmd,
                              ! WinIsMenuItemChecked (hwndMenu, COMMANDMSG (&msg) -> cmd));

            WinInvalidateRect (hwnd, NULL, TRUE);
            return 0;

        case WM_PAINT:
            hps = WinBeginPaint (hwnd, NULLHANDLE, NULL);

            GpiErase (hps);

            // Get new fonts if they've changed

            if (QFA_PUBLIC & GpiQueryFontAction (hps, QFA_PUBLIC))
            {
                free (pfm);
                lFonts = GetAllBitmapFonts (hps, & pfm);
            }

            // Set POINTL structure to upper left corner of client

            ptl.x = 0;
            ptl.y = cyClient;

            // Loop through all the bitmap fonts

            for (l = 0; l < lFonts; l++)
            {
                // Define the FATTRS structure

                fat.usRecordLength = sizeof (FATTRS);

                fat.fsSelection = (fItalic ? FATTR_SEL_ITALIC : 0) |
                                (fUnder ? FATTR_SEL_UNDERSCORE : 0) |

```

```

                                (fOutline ? FATTR_SEL_OUTLINE : 0) |
                                (fStrike ? FATTR_SEL_STRIKEOUT : 0) |
                                (fBold ? FATTR_SEL_BOLD : 0);

                fat.lMatch = 0;

                strcpy (fat.szFacename, pfm[l].szFacename);

                fat.idRegistry = pfm[l].idRegistry;
                fat.usCodePage = pfm[l].usCodePage;
                fat.lMaxBaselineExt = pfm[l].lMaxBaselineExt;
                fat.lAveCharWidth = pfm[l].lAveCharWidth;
                fat.fsType = 0;
                fat.fsFontUse = 0;

                // Create the logical font and select it

                GpiCreateLogFont (hps, NULL, LCID_FONT, &fat);
                GpiSetCharSet (hps, LCID_FONT);

                // Query the font metrics of the current font

                GpiQueryFontMetrics (hps, sizeof (PFONMETRICS), &fm);

                // Set up a text string to display

                sprintf (szBuffer, " \xDB %s - %d points \xDB ",
                        fm.szFacename, fm.sNominalPointSize / 10);

                // Drop POINTL structure to baseline of font

                ptl.y -= fm.lMaxAscender;

                // Display the character string

                GpiCharStringAt (hps, &ptl, strlen (szBuffer), szBuffer);

                // Adjust text box points for left baseline

                GpiQueryTextBox (hps, strlen (szBuffer), szBuffer,
                                TXTBOX_COUNT, &ptl1);

                for (i = 0; i < TXTBOX_COUNT; i++)
                {
                    &ptl1[i].x += ptl.x;
                    &ptl1[i].y += ptl.y;
                }

                // Possibly display the baseline

                if (fBaseline)
                {
                    GpiMove (hps, &ptl);
                    GpiLine (hps, &ptl + TXTBOX_CONCAT);
                }

                // Possibly display the character box

                if (fTextBox)
                {
                    GpiMove (hps, &ptl1 + TXTBOX_TOPLEFT);
                    GpiLine (hps, &ptl1 + TXTBOX_TOPRIGHT);
                    GpiLine (hps, &ptl1 + TXTBOX_BOTTOMRIGHT);
                    GpiLine (hps, &ptl1 + TXTBOX_BOTTOMLEFT);
                    GpiLine (hps, &ptl1 + TXTBOX_TOPLEFT);
                }

                // Drop POINTL structure down to bottom of text

                ptl.y -= fm.lMaxDescender;

                // Select the default font; delete the logical font

                GpiSetCharSet (hps, LCID_DEFAULT);
                GpiDeleteSetId (hps, LCID_FONT);
            }

            WinEndPaint (hps);
            return 0;

        case WM_DESTROY:
            if (lFonts > 0)
                free (pfm);

            return 0;
    }

    return WinDefWindowProc (hwnd, msg, wpl, wpl2);
}

```

FONT_MATCH if a matching font could be found, or FONT_DEFAULT if there is no match, which means the local ID is associated with the default font.

The first parameter is a handle to the presentation space, the second parameter is an eight-character name to be associated with the font. This second parameter is useful only if the function call is stored in a metafile. Normally, you just

set this parameter to NULL.

The lcid parameter is the local ID, which is simply a number ranging from 0 to 254. (The word *local* indicates that it only has meaning within a particular presentation space.) You use this number to refer to the logical font in later function calls. A value of 0 means that the font will be the new default for the presentation space, so you usually choose

numbers between 1 and 254.

The final parameter is a pointer to a FATTRS (font attributes) structure, which describes the font you want. The FATTRS structure has ten fields, some of which correspond directly to fields of the FONMETRICS structure. BITFONTS shows one approach to defining the fields of the FATTRS structure.

The usRecordLength field of the

BITFONTS.RC

Complete Listing

```

/*-----
  BITFONTS.RC resource script file
  -----*/

#include <os2.h>
#include "bitfonts.h"

MENU ID_RESOURCE
{
  SUBMENU "Attributes",      IDM_ATTRS
  {
    MENUITEM "Italic",      IDM_ITALIC
    MENUITEM "Underscore",  IDM_UNDERSCORE
    MENUITEM "Outline",     IDM_OUTLINE
    MENUITEM "Strikeout",   IDM_STRIKEOUT
    MENUITEM "Bold",        IDM_BOLD
  }
  SUBMENU "Show",           IDM_SHOW
  {
    MENUITEM "Baseline",    IDM_BASELINE
    MENUITEM "Text Box",    IDM_TEXTBOX
  }
}

```



Figure 3: This resource script defines the BITFONTS program's menu.

FATTRS structure is always set to the size of the structure. The fsSelection field contains bit flags to indicate the font attributes—italic, underscore, strikeout, and boldface. BITFONTS sets this field using constants beginning with FATTR_SEL according to the menu selections. Although BITFONTS can also set the FATTR_SEL_OUTLINE bit, this flag only works for outline fonts, in which case it displays the unfilled outlines of the characters. It does not work for bitmap fonts.

BITFONTS sets the lMatch field to 0. I'll have more to say about this field of the FATTRS structure in the next issue.

The program sets the next five fields of the FATTRS structure (szFacename, idRegistry, usCodePage, lMaxBaselineExt, and lAveCharWidth) to the corresponding fields of the FONTMETRICS structure. This is a rather conservative approach. In reality, the idRegistry and usCodePage fields can be set to 0 for the bitmap fonts. But when selecting a symbol or dingbat font, the usCodePage field must be set to 65400.

The last two fields (fsType and fsFontUse) are normally set to 0 for bitmap fonts. You use the fsType field to enable kerning or select an anti-aliased font (neither of which is supported by bitmap fonts) or to use a double-byte character set. As we'll see in a future column, the fsFontUse field is used mostly for select-

ing an outline font rather than a bitmap font.

After BITFONTS calls GpiCreateLogFont, the font is associated with a local ID. In BITFONTS, the local ID is always the number 1. The next step is to select the font for use in the presentation space:

```
GpiSetCharSet hps, lcid);
```

Following this call, all text output to the presentation space will use the selected font. In a real program, a program could associate 254 logical fonts with local IDs and switch between fonts by calling GpiSetCharSet.

After displaying the text—described in the next section—BITFONTS selects the default font into the presentation space by calling:

```
GpiSetCharSet hps,
  LCID_DEFAULT);
```

The LCID_DEFAULT constant is defined as 0 in the PMGPI.H header file. Finally, the local ID is deleted, essentially removing the font definition information from the presentation space:

```
GpiDeleteSetId (hps, lcid);
```

BITFONTS then moves on to the next font.

TEXT OUTPUT FUNCTIONS After selecting the font into the presentation space, BITFONTS is ready to display some text. GPI includes four text output functions that display text. The simplest of these is GpiCharString:

```
GpiCharString (hps, lCount,
  pString);
```

The second parameter is the number of characters to display; the third parameter is a pointer to the character string. The function displays the text string at the current position, which is set by many line-drawing functions. The current position corresponds to the baseline at the left side of the first character in the string. After displaying the string, the function sets the current position to the baseline at the end of the character string. This is convenient for drawing a line of text using multiple GpiCharString calls.

The function that BITFONTS uses is a little different:

```
GpiCharStringAt (hps, &ptl,
  lCount, pString);
```

The second parameter is a pointer to a POINTL structure, which has two fields (named x and y) that indicate the starting point of the text, again corresponding to the baseline at the left side of the first character.

In a future column, I'll explore two additional text functions (GpiCharStringPos and GpiCharStringPosAt) that allow precise placement of each individual character in a string.

After selecting the font in the presen-

BITFONTS.H

Complete Listing

```

/*-----
  BITFONTS.H header file
  -----*/

#define ID_RESOURCE      1

#define IDM_ATTRS        10
#define IDM_ITALIC        11
#define IDM_UNDERSCORE    12
#define IDM_OUTLINE      13
#define IDM_STRIKEOUT     14
#define IDM_BOLD          15

#define IDM_SHOW          20
#define IDM_BASELINE      21
#define IDM_TEXTBOX       22

```

Figure 4: The header file defines constants used in the BITFONTS source code and resource script.

BITFONTS.DEF

Complete Listing

```

;-----
; BITFONTS.DEF module definition file
;-----

NAME                BITFONTS  WINDOWAPI

DESCRIPTION          'Bitmap Fonts in OS/2 2.0 PM (c) Charles Petzold, 1993'
PROTMODE

```



PERFECT CONSISTENCY BITFONTS contains a menu item labeled Show with two options: Baseline and Text Box. To implement these options, I've made use of the GpiQueryTextBox function:

```

GpiQueryTextBox (hps, lCount,
                pString, lPoints, aptl) ;

```

The third parameter is a pointer to a character string, and the second parameter is the length of that string. The fourth parameter is most often set to the constant TXTBOX_COUNT (which is equal to 5) and the last parameter is an array of five POINTL structures.

After calling this function, you can index the array of POINTL structures using five constants beginning with the TXTBOX prefix. The five points indicate the four corners of a box that encloses the text string and the point at the baseline of the right side of the last character

Figure 5: This is BITFONTS's module definition file.

tation space, but before displaying the text, BITFONTS calls GpiQueryFontMetrics to obtain the FONTMETRICS information for the currently selected font. Of course, this information is available in the array of FONTMETRICS structures which was obtained earlier, but in the general case you may not have that array.

By default, GPI defines a coordinate space with an origin at the lower-left corner of the client area, where horizontal coordinates increase to the right and ver-

tical coordinates increase going up. So in order to display successive lines of text going down the client area, you need to begin at the top with a maximum vertical coordinate and then progressively decrease it.

For that reason, BITFONTS begins by initializing a POINTL structure with the x field equal to 0 and the y field equal to the height of the client area. (The height of the client area is obtained while processing the WM_SIZE message.) After obtaining the FONTMETRICS structure and before displaying the

first line of text, the program subtracts the value of the lMaxAscender field of the FONTMETRICS structure from the y field of the POINTL structure. As you may recall, the lMaxAscender field is the height above the baseline of the tallest character in the font. Because the POINTL structure passed to the GpiCharStringAt function indicates the starting point of the string at the baseline of the left side of the character, this adjustment is necessary for all of the characters to be displayed within the client area.

After displaying the line of text, BITFONTS subtracts the value of the lMaxDescender field of the FONTMETRICS structure from the y field of the POINTL structure. Following this adjustment, the POINTL structure indicates the bottom of the text line. For the next line of text, the process is repeated by first subtracting the lMaxAscender field before displaying the text.

BITFONTS begins

by initializing a

POINTL structure with

the x field equal to 0

and the y field equal

to the height of

the client area.

of the string. You use TXTBOX_TOPLEFT, TXTBOX_BOTTOMLEFT, TXTBOX_TOPRIGHT, and TXTBOX_BOTTOMRIGHT to index the array to get the four corners of the text box. The fifth point is called the concatenation point and is obtained by indexing the POINTL structure with the TXTBOX_CONCAT constant. All coordinate points are relative to the starting point of the string—the baseline at the left side of the first character.

BITFONTS adjusts these five points to be real coordinates by adding to the x and y fields the x and y fields of the POINTL structure used for displaying the text. The program then optionally draws the baseline and the text box using the GpiMove and GpiLine functions. Fig-

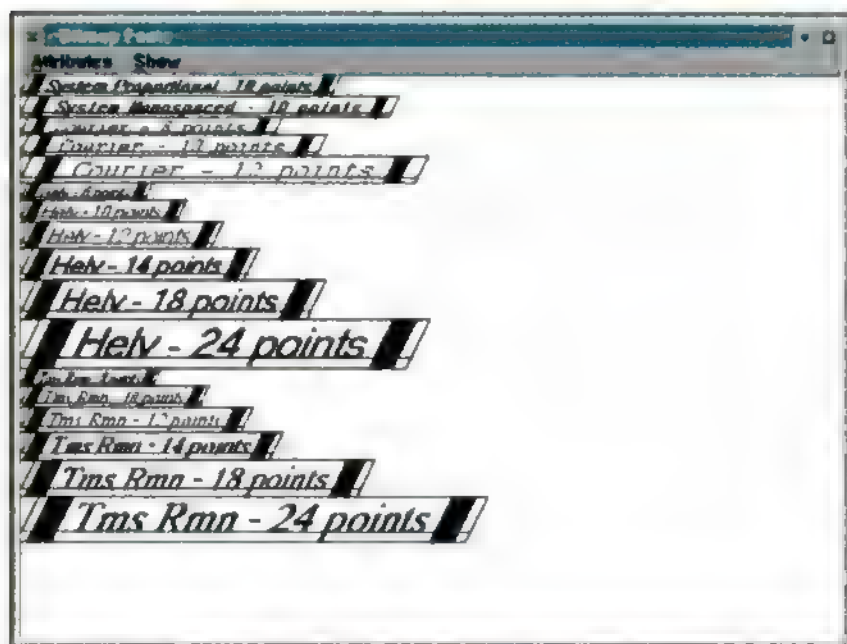


Figure 6: This shows all bitmap fonts available under OS/2 2.0.

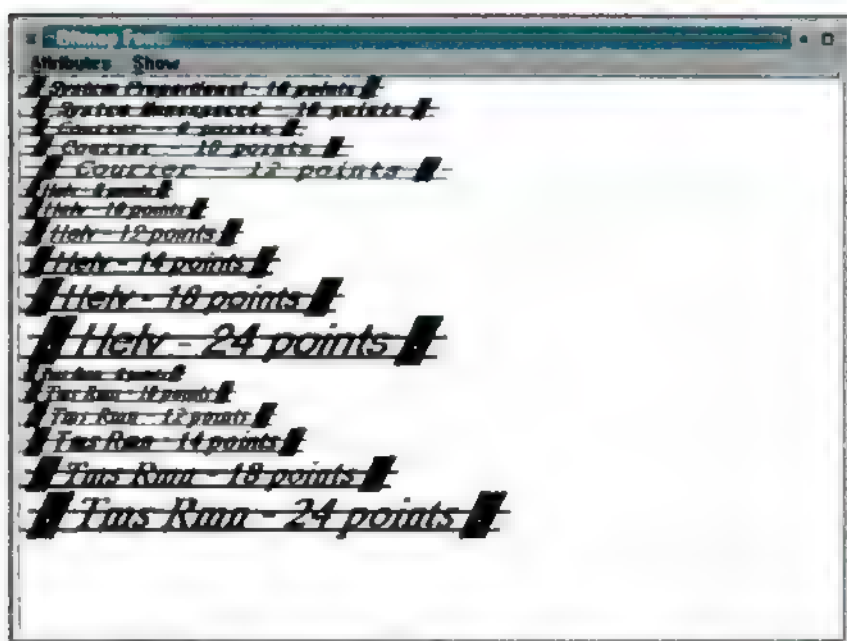


Figure 7: The bitmap fonts with italic, underline, strikeout, and boldface attributes.

ure 8 shows the BITFONTS display for an italic font with the Baseline and Text Box options selected.

As you can see, everything is perfectly consistent. Indeed, when you call the `GpiQueryTextBox` function, the vertical coordinates of the upper-left and upper-right corner points are exactly equal to the `lMaxAscender` field of the `FONTMETRICS` structure for the font. Similarly, the vertical coordinates of the lower-left and lower-right corner points are exactly equal to the `lMaxDescender` field. The solid block character fits precisely within the text box, and each line of text is perfectly spaced.

Don't expect such consistency when we begin working with outline fonts a couple of issues from now. When you attempt to reconcile the text box, the `lMaxAscender` and `lMaxDescender` fields of the `FONTMETRICS` structure, and the actual height of the characters, you'll find slight differences that are evidently the result of rounding errors.

Note also that the text box is tilted for italic fonts, and the lower-left corner be-

low the baseline is actually outside the window's client area. In a real program, this information can help in intelligently positioning italic text. Again, don't expect the text box to be quite so obliging when we start working with outline fonts.

ONE FINAL FUNCTION There's one additional GPI function BITFONTS uses—`GpiQueryFontAction`—that informs you if there's been any change in the installed fonts since the last time you called it. This can happen if fonts are installed or deleted from the system during the time the program is running. I call this function once during the `WM_CREATE` message and then again during the `WM_PAINT` message. If there's been a change in the public fonts, the program frees the existing array of `FONTMETRICS` structures and calls the `GetAllBitmapFonts` function again. Though it's unlikely that users will be deleting or installing bitmap fonts while BITFONTS

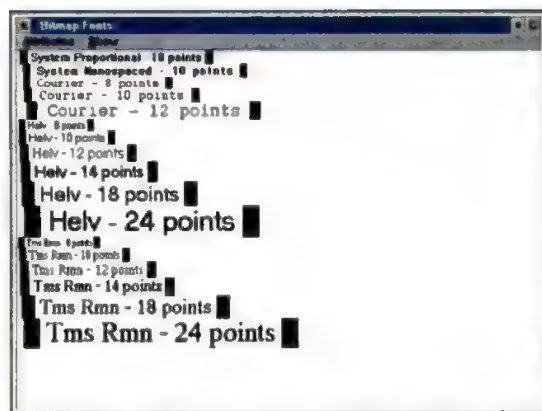


Figure 8: This shows the italic bitmap fonts with the baseline and text box options selected.

is running, I thought it would be best to include this test.

In the next couple of issues we'll explore other GPI functions that are useful for working with bitmap fonts, and maybe a couple that are not so useful! But the first order of business will be to simplify font selection logic and make it more efficient through use of the `lMatch` field in the `FATTRS` structure. □

Turn your
excess inventory
into a tax break
and help send needy
kids to college.

Call for your
free guide
to learn how donating your
slow moving inventory
can mean a generous
tax write off
for your company.

Call 708-690-0010

PETER ROSKAM
Executive Director



P.O. Box 3021, Glen Ellyn, IL 60138
Fax (708) 690-0565



Claudia did not have the finances to finish college. Excess inventory donations to EAL gave her the scholarship she needed to graduate. Claudia is now with a leading financial trading firm, happily married with twin daughters.

Excess inventory today...student opportunity tomorrow

Exploring Windows System Registry Performance Data

BY RAY DUNCAN

In the last installment of this column I introduced you to the Windows System Registry, a sort of memory-resident database structured as a binary tree or trees. The location of any particular value in the database is specified by a series of ASCII keys separated by backslashes, very similar to a pathname in the FAT file system. In Windows 3.1, the System Registry is used mainly to store information about OLE (Object Linking and Embedding) and about File Manager associations (linkages of file types to the applications which can process that file type). In Windows NT, the System Registry holds a great deal of other information as well, some of it very critical to the operation of the operating system, such as hardware configuration, per-user program groups, and access control lists.

One of the odder things about the Windows NT System Registry is that it contains a rather elaborate block of system performance information that is updated, if not in real time, at least on a very frequent basis. The decision of the Windows NT architects to store this information in the Registry seems counterintuitive in many ways. Using the old Windows 3.x .INI files as a yardstick, we would expect the Registry to be used only for essentially static information—the type of information that is queried or modified by administrative utilities such as the Windows NT Control Panel, Windows NT Setup, and application installation programs. The concept of the NT kernel formatting all its internal performance data into a Registry-specific structure and slamming it into the Registry by a back door several times per second certainly clashes with this mental model of the super-INI file.

Nevertheless, the location of the performance data turns out to be highly con-

venient, since it allows us to use the general-purpose System Registry API functions to get at the information. Moreover, everything we learn about the System Registry APIs and the structure of the Registry itself in the course of playing with the performance data will serve us well in other contexts later. Using the System Registry for storage of the performance information is economical on a system-wide basis as well, since it eliminates the need for other specialized APIs that most people would never use (and

Using the elaborate block of system performance information contained in the Registry, our sample program displays actual performance data associated with various objects.

that, judging by past experience, Microsoft would probably fail to document for at least the first several releases of the operating system, anyway).

RETRIEVING PERFORMANCE DATA Last issue's example programs, CPUTYPE.C and SYSMON.C, demonstrated the basic procedure for retrieving a particular chunk of data from the System Registry. The first step is usually to call RegOpenKey() or RegOpenKeyEx() with a valid registry key handle, a key path string, the address of a variable to receive a new key handle, and (in the case of RegOpenKeyEx) a flag that describes the type of access requested. Of course, in order to get started walking through one of the Registry's trees of keys, you need a toe-

hold, and Windows NT provides one in the form of five predefined key handles that correspond to the roots of the Registry's five (documented) trees:

```
HKEY_CLASSES_ROOT
HKEY_CURRENT_USER
HKEY_LOCAL_MACHINE
HKEY_USERS
HKEY_PERFORMANCE_DATA
```

You can use the new key handle returned by RegOpenKey() or RegOpenKeyEx() along with other APIs in order to enumerate the branches that lie beneath the node of the tree that corresponds to that handle, then call RegOpenKey() or RegOpenKeyEx() again to descend a level in the tree. Alternatively, you can use the key handle to retrieve data stored at that node of the tree. In the latter case, you can first call RegQueryInfoKey() to find out how much memory you'll need in the worst case to store the data. You then call RegQueryValue() or RegQueryValueEx() with the key handle and a value name to actually extract the data from the Registry. Finally, you release the key handle by calling RegCloseKey().

So much for generalities. The performance data block is obtained from the Registry by calling RegQueryValueEx() with the predefined key HKEY_PERFORMANCE_DATA and the value name *Global*. Since this data is accessed directly using one of the predefined key handles, no prior call to RegOpenKey() or RegOpenKeyEx() is needed, nor is any subsequent call to RegCloseKey(). The size of the data block is unpredictable because it depends on the configuration of the system, the number of CPUs, the number of processes running, the nature of those processes, as well as other factors. However, the block can turn out to be fairly large even on a lightly loaded

system; it's about 16K on mine.

In order to decipher the performance data block and display it in a form useful to humans, you also need another chunk of data from the Registry, the so-called Titles Database. This data is found under the key

```
\HKEY_LOCAL_MACHINE\SOFTWARE
\MICROSOFT\WINDOWS NT
\CURRENTVERSION\PERFLIB\409
```

with the value name *Counters*. A symmetric data block that contains free-text descriptions of each member of the Titles Database is found under the same key with the value name *Help*.

UNDERSTANDING THE DATA Let's dispose of the Titles Database first, since its structure is straightforward. The Titles Database consists of a series of pairs of null-terminated strings, and the entire set is terminated by an extra null byte. The first string of each pair is a decimal number, called a *title index*, and the second is the title string that corresponds to that index. For example, in the July 1992 PDK release of Windows NT, the first few string pairs of the Titles Database look like this:

```
2
System
1
Memory
6
Processor Time
```

We'll see how we can put these title indexes and title strings to use in a moment.

The Performance Data Block has a much more complex structure. It contains binary data and is built out of a handful of repetitive elements, the number of each type of element being dependent on the current state of the system. The data block is "self-describing"

*The performance data block
is built out of a handful
of repetitive elements,
the number of each
type of element being
dependent on the current
state of the system.*

in the sense that each element contains a unique identifier and a pointer or size field that allows you to find the next element. You can easily write a program that traverses the data block and picks out only the information you're interested in; this requires only minimal knowledge about the other types of information that are present. The detailed specifications of the structures and magic values found in the performance data block are em-

bodied in the header file WINPERF.H, which you can find among the files copied into the MSTOOLS directory by the Windows NT SDK setup program.

Let's take a closer look at the performance data, starting at the most abstract level and working our way down. As shown in Figure 1, in the simplest sense the performance data can be thought of as having two parts: a header block and a variable data block. The header contains (among other things) a signature, a structure version number, the system name, the size of the header in bytes, the size of the entire performance data block in bytes, a time stamp, the frequency at which the performance data is being collected and placed in the Registry, and the number of types of system objects that will be found in the variable data block. We can use the header size field to find the address of the beginning of the variable data.

The variable data is in turn subdivided into multiple blocks, one for each type of object in the system. The total number of these object type blocks is given in the performance data block header. Each object type block is subdivided yet again into three parts: an object type header, counter definitions, and object instance data. The object type header contains (among other things) its own length, the size of the entire object type data block, the number of instances of this type of object, the number of counters for each object instance, and a title index. The title

The Windows NT System Registry Performance Data Block

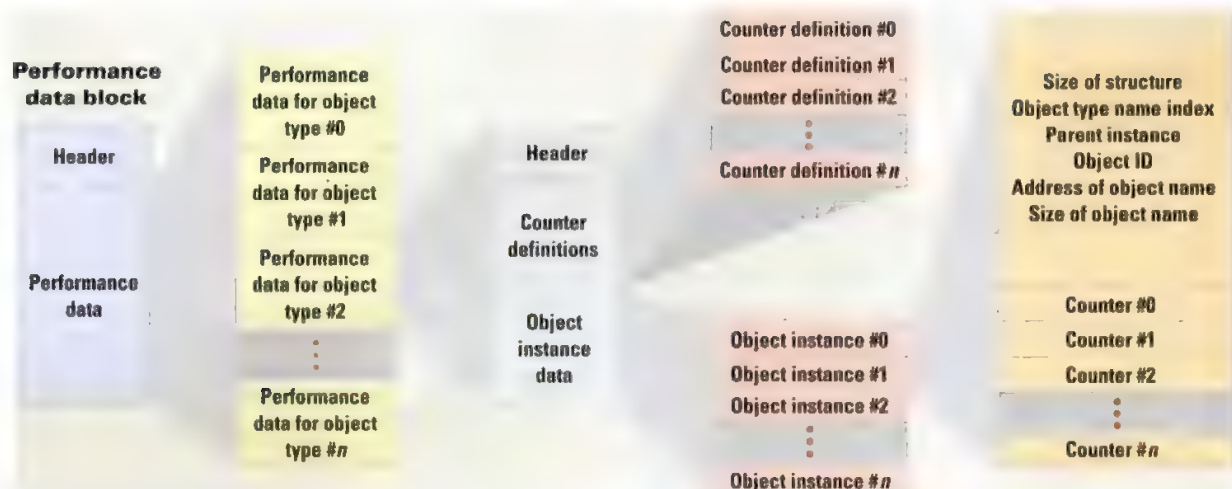


Figure 1: The global structure of the Windows NT Performance Data Block.

PROCMON.C

1 of 3

```

// ProcMon - Simple Process Performance Monitor for Windows/NT
// Copyright (C) 1992 Ray Duncan
// PC Magazine - Ziff Davis Publishing

#define dim(x) (sizeof(x) / sizeof(x[0])) // returns no. of elements
#define MALLOCINCR 4096

#include <stdlib.h>
#include <string.h>
#include <windows.h>
#include <winperf.h>
#include "procmon.h"

HANDLE hInst; // module instance handle
HWND hFrame; // handle for frame window
HWND hLeft; // handle for left child window
HWND hRight; // handle for right child window
HFONT hFont; // handle for nonprop. font
INT CharX, CharY; // character dimensions

char szFrameClass[] = "ProcMon"; // classname for frame window
char szAppName[] = "Process Monitor"; // long application name
char szMenuName[] = "ProcMonMenu"; // name of menu resource
char szIcon[] = "ProcMonIcon"; // name of icon resource
char szIni[] = "ProcMon.ini"; // name of private INI file

DWORD dwPerfDataLen = 0; // size of performance data
PPERFDATA pPerfData; // addr of perf data block
PPERFGROUP pFirstGroup; // addr of first object group
INT iTotGroups; // total object groups
PPERFCOUNTERDEF pCounterDef; // addr of counter definitions
INT iTotCounters; // counters per instance
PSTR pTitles; // addr of object title database

//
// Table of window messages supported by FrameWndProc()
// and the functions which correspond to each message.
//
struct decodeMsg frameMsgs[] = {
    WM_CREATE, DoCreate,
    WM_SIZE, DoSize,
    WM_COMMAND, DoCommand,
    WM_SETFOCUS, DoSetFocus,
    WM_CLOSE, DoClose,
    WM_DESTROY, DoDestroy, };

//
// Table of menu item IDs and their corresponding functions.
//
struct decodeMsg menuItem[] = {
    IDM_EXIT, DoMenuExit,
    IDM_ABOUT, DoMenuAbout,
    IDM_REFRESH, DoRefresh, };

//
// Table of magic numbers for counter types and corresponding strings
//
struct decodeUINT counterNames[] = {
    PERF_COUNTER_COUNTER, "PERF_COUNTER_COUNTER",
    PERF_COUNTER_TIMER, "PERF_COUNTER_TIMER",
    PERF_COUNTER_QUEUELEN, "PERF_COUNTER_QUEUELEN",
    PERF_COUNTER_BULK_COUNT, "PERF_COUNTER_BULK_COUNT",
    PERF_COUNTER_TEXT, "PERF_COUNTER_TEXT",
    PERF_COUNTER_RAWCOUNT, "PERF_COUNTER_RAWCOUNT",
    PERF_SAMPLE_FRACTION, "PERF_SAMPLE_FRACTION",
    PERF_SAMPLE_COUNTER, "PERF_SAMPLE_COUNTER",
    PERF_COUNTER_NODATA, "PERF_COUNTER_NODATA",
    PERF_COUNTER_TIMER_INV, "PERF_COUNTER_TIMER_INV",
    PERF_SAMPLE_BASE, "PERF_SAMPLE_BASE",
    PERF_AVERAGE_TIMER, "PERF_AVERAGE_TIMER",
    PERF_AVERAGE_BASE, "PERF_AVERAGE_BASE",
    PERF_AVERAGE_BULK, "PERF_AVERAGE_BULK",
    PERF_100NS_TIMER, "PERF_100NS_TIMER",
    PERF_100NS_TIMER_INV, "PERF_100NS_TIMER_INV",
    PERF_COUNTER_MULTI_TIMER, "PERF_COUNTER_MULTI_TIMER",
    PERF_COUNTER_MULTI_TIMER_INV, "PERF_COUNTER_MULTI_TIMER_INV",
    PERF_COUNTER_MULTI_BASE, "PERF_COUNTER_MULTI_BASE",
    PERF_100NS_MULTI_TIMER, "PERF_100NS_MULTI_TIMER",
    PERF_100NS_MULTI_TIMER_INV, "PERF_100NS_MULTI_TIMER_INV",
    PERF_RAW_FRACTION, "PERF_RAW_FRACTION",
    PERF_RAW_BASE, "PERF_RAW_BASE",
    PERF_COUNTER_HISTOGRAM, "PERF_COUNTER_HISTOGRAM", };

WinMain(), InitApp(), and other generic routines omitted

//
// DoCreate -- process WM_CREATE message for frame window. Create two
// listbox controls that are tiled vertically inside the frame window.
// These controls will be used as child windows for listing of processes
// and their counters.
//
LONG DoCreate(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    // create left-hand child window as a listbox control
    hLeft = CreateWindow(
        "listbox", // window class name
        NULL, // text for title bar
        WS_CHILD | WS_VISIBLE | // window style
        WS_VSCROLL | WS_BORDER | LBS_NOTIFY | LBS_DISABLENOSCROLL,
        0, 0, 0, 0, // position and size
        hWnd, // frame window is parent
        0, // child window identifier
        hInst, // window owner
        NULL); // unused pointer

    // create right-hand child window as a listbox control
    hRight = CreateWindow(
        "listbox", // window class name
        NULL, // text for title bar
        WS_CHILD | WS_VISIBLE | // window style
        WS_VSCROLL | WS_BORDER | LBS_NOTIFY | LBS_DISABLENOSCROLL,
        0, 0, 0, 0, // position and size
        hWnd, // frame window is parent
        0, // child window identifier
        hInst, // window owner
        NULL); // unused pointer

    return(FALSE);
}

//
// DoSize -- process WM_SIZE message for frame window. Recalculate
// lines per page, if window has grown and at end of file may need to
// change first line in window and refresh it.
//
LONG DoSize(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i, j;

    // make left window just wide enough for longest process name
    i = (CharX * 10) + GetSystemMetrics(SM_CXVSCROLL);
    j = LOWORD(lParam) - i;
    MoveWindow(hLeft, 0, 0, i, HIWORD(lParam), TRUE);

    // resize right child window to use remainder of client area
    MoveWindow(hRight, i, 0, j, HIWORD(lParam), TRUE);

    return(FALSE);
}

//
// DoRefresh -- rebuild the information for display according to
// the currently selected display type, then refresh the window.
//
LONG DoRefresh(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    EmptyLeftLines(); // discard old output
    EmptyRightLines();

    // fetch fresh copy of system performance data block
    GetPerfData();

    // display process list in the left listbox control
    ShowProcesses();

    return(FALSE);
}

//
// ShowProcesses -- displays list of process instances from system registry
//
VOID ShowProcesses(VOID)
{
    char temp[256];
    PPERFGROUP pCurGroup;
    PPERFINSTANCE pCurInst;
    PPERFCOUNTERDEF pCurCounter;
    INT iCurInst;
    INT iTotInst;

    // find appropriate object group within the performance data
    pCurGroup = FindGroup("Process");

    // bail out now if there is nothing to display
    if(pCurGroup == NULL)
    {
        MessageBox(hFrame, "No process object group found!", szAppName,
            MB_ICONSTOP | MB_OK);
        exit(1);
    }

    // calculate pointer to first instance, extract total number
    // of instances from the header for the process object group
    pCurInst = (PPERFINSTANCE) ((PBYTE) pCurGroup +
        pCurGroup->DefinitionLength);
    iTotInst = pCurGroup->NumInstances;

    // calculate pointer to counter definitions for this object type,
    // extract number of counters per instance of this object type
    pCounterDef = (PPERFCOUNTERDEF) ((PBYTE) pCurGroup +
        pCurGroup->HeaderLength);
    iTotCounters = pCurGroup->NumCounters;

    for(iCurInst = 0; iCurInst < iTotInst; iCurInst++)
    {
        // convert UNICODE process name to ASCII and display it, ask
        // listbox to save pointer to the instance along with the string
    }
}

```

```

WS_CHILD | WS_VISIBLE | // window style
WS_VSCROLL | WS_BORDER | LBS_NOTIFY | LBS_DISABLENOSCROLL,
0, 0, 0, 0, // position and size
hWnd, // frame window is parent
0, // child window identifier
hInst, // window owner
NULL); // unused pointer

// create right-hand child window as a listbox control
hRight = CreateWindow(
    "listbox", // window class name
    NULL, // text for title bar
    WS_CHILD | WS_VISIBLE | // window style
    WS_VSCROLL | WS_BORDER | LBS_NOTIFY | LBS_DISABLENOSCROLL,
    0, 0, 0, 0, // position and size
    hWnd, // frame window is parent
    0, // child window identifier
    hInst, // window owner
    NULL); // unused pointer

return(FALSE);
}

//
// DoSize -- process WM_SIZE message for frame window. Recalculate
// lines per page, if window has grown and at end of file may need to
// change first line in window and refresh it.
//
LONG DoSize(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i, j;

    // make left window just wide enough for longest process name
    i = (CharX * 10) + GetSystemMetrics(SM_CXVSCROLL);
    j = LOWORD(lParam) - i;
    MoveWindow(hLeft, 0, 0, i, HIWORD(lParam), TRUE);

    // resize right child window to use remainder of client area
    MoveWindow(hRight, i, 0, j, HIWORD(lParam), TRUE);

    return(FALSE);
}

//
// DoRefresh -- rebuild the information for display according to
// the currently selected display type, then refresh the window.
//
LONG DoRefresh(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    EmptyLeftLines(); // discard old output
    EmptyRightLines();

    // fetch fresh copy of system performance data block
    GetPerfData();

    // display process list in the left listbox control
    ShowProcesses();

    return(FALSE);
}

//
// ShowProcesses -- displays list of process instances from system registry
//
VOID ShowProcesses(VOID)
{
    char temp[256];
    PPERFGROUP pCurGroup;
    PPERFINSTANCE pCurInst;
    PPERFCOUNTERDEF pCurCounter;
    INT iCurInst;
    INT iTotInst;

    // find appropriate object group within the performance data
    pCurGroup = FindGroup("Process");

    // bail out now if there is nothing to display
    if(pCurGroup == NULL)
    {
        MessageBox(hFrame, "No process object group found!", szAppName,
            MB_ICONSTOP | MB_OK);
        exit(1);
    }

    // calculate pointer to first instance, extract total number
    // of instances from the header for the process object group
    pCurInst = (PPERFINSTANCE) ((PBYTE) pCurGroup +
        pCurGroup->DefinitionLength);
    iTotInst = pCurGroup->NumInstances;

    // calculate pointer to counter definitions for this object type,
    // extract number of counters per instance of this object type
    pCounterDef = (PPERFCOUNTERDEF) ((PBYTE) pCurGroup +
        pCurGroup->HeaderLength);
    iTotCounters = pCurGroup->NumCounters;

    for(iCurInst = 0; iCurInst < iTotInst; iCurInst++)
    {
        // convert UNICODE process name to ASCII and display it, ask
        // listbox to save pointer to the instance along with the string
    }
}

```

Figure 2: Extracts from PROCMON.C, a simple program that uses the System Registry's performance data block to display information about a selected process.

PROCMON.C

2 of 3

```

wctombs(temp, (LPWSTR) ((PBYTE) pCurInst + pCurInst->NameOffset),
        pCurInst->NameLength/sizeof(WCHAR));
AddLeftLine(temp, pCurInst);

// advance to next process instance
pCurCounter = (PPERFCOUNTER) ((PBYTE) pCurInst +
        pCurInst->ByteLength);
pCurInst = (PPERFINSTANCE) ((PBYTE) pCurCounter +
        pCurCounter->ByteLength);
}

//
// ShowCounters -- display counters in right child window in response
// to selection of a process name in the left window. This routine
// is called when a WM_COMMAND message of type LBN_SELCHANGE is
// received. In order to keep the code simple, we just display the
// raw counter values along with the counter name and the counter type.
//
VOID ShowCounters(VOID)
{
    char temp[256];
    INT i;
    PPERFINSTANCE pCurInst;
    PPERFCOUNTERDEF pCurCounterDef;
    PINT pCurCounter;
    INT iSel;

    EmptyRightLines(); // discard old output

    // retrieve pointer to process instance object associated with
    // the selected line in the listbox
    iSel = SendMessage(hLeft, LB_GETCURSEL, 0, 0);
    pCurInst = (PPERFINSTANCE) SendMessage(hLeft, LB_GETITEMDATA, iSel, 0);

    // point to first counter definition for process object group
    pCurCounterDef = pCounterDefs;

    // loop through counters and display each one in raw form
    for(i = 0; i < iTotCounters; i++)
    {
        // calculate address of counter value
        pCurCounter = (PINT) ((PBYTE) pCurInst + pCurInst->ByteLength
            + pCurCounterDef->CounterOffset);

        // format counter name, raw value, and type for display
        wprintf(temp, "%-32s %-15d %s",
            FindTitle(pCurCounterDef->CounterNameTitleIndex),
            *pCurCounter, FindCounterName(pCurCounterDef->CounterType));
        AddRightLine(temp);

        // advance to next counter definition
        pCurCounterDef = (PPERFCOUNTERDEF) ((PBYTE) pCurCounterDef +
            pCurCounterDef->ByteLength);
    }

    //
    // AddLeftLine -- called with a pointer to an ASCII string and a
    // 32-bit value, adds the string to the process listbox and then
    // associates the value with string index returned by the listbox.
    //
    VOID AddLeftLine(char * p, VOID * q)
    {
        INT i;

        // add string to the message box, save its index
        i = SendMessage(hLeft, LB_ADDSTRING, 0, (LONG) p);

        // store associated data for the string
        SendMessage(hLeft, LB_SETITEMDATA, i, (LONG) q);
    }

    //
    // EmptyLeftLines - clears out the process instance listbox.
    //
    VOID EmptyLeftLines(VOID)
    {
        SendMessage(hLeft, LB_RESETCONTENT, 0, 0);
    }

    //
    // AddRightLine -- called with a pointer to an ASCII string,
    // adds the string to the counter listbox.
    //
    VOID AddRightLine(char * p)
    {
        // add string to the message box, save its index
        SendMessage(hRight, LB_ADDSTRING, 0, (LONG) p);
    }

    //
    // EmptyRightLines - clears out the process counter listbox.
    //
    VOID EmptyRightLines(VOID)
    {
        SendMessage(hRight, LB_RESETCONTENT, 0, 0);
    }

    //
    // GetPerfData() - obtain performance data block from the

```

```

// system registry. The size of the data cannot be known in advance
// so the buffer is expanded incrementally until it is big enough.
//
BOOL GetPerfData(VOID)
{
    INT iCurGroup;
    PPERFGROUP pCurGroup;
    DWORD dwBufferSize = dwPerfDataLen;

    while(ERROR_MORE_DATA ==
        RegQueryValueEx(HKEY_PERFORMANCE_DATA, "Global",
            NULL, NULL, (PSTR) pPerfData, &dwBufferSize))
    {
        dwPerfDataLen += MALLOCINCR;
        dwBufferSize = dwPerfDataLen;
        pPerfData = (PPERFDATA) realloc(pPerfData, dwPerfDataLen);

        if(pPerfData == NULL)
        {
            MessageBox(hFrame, "GetPerfData malloc failed!", szAppName,
                MB_ICONSTOP | MB_OK);
            return(FALSE);
        }
    }

    // point to first object group within the data block and
    // save total number of object groups
    pFirstGroup = (PPERFGROUP) ((PBYTE) pPerfData + pPerfData->HeaderLength);
    iTotGroups = pPerfData->NumObjectTypes;

    // point to the first group of objects
    pCurGroup = pFirstGroup;

    // look up titles for each object type and save pointer
    // within the object group's header structure
    for(iCurGroup = 0; iCurGroup < iTotGroups; iCurGroup++)
    {
        pCurGroup->ObjectNameTitle = (LPWSTR)
            FindTitle(pCurGroup->ObjectNameTitleIndex);

        // advance to next group of objects
        pCurGroup = (PPERFGROUP) ((PBYTE) pCurGroup +
            pCurGroup->TotalByteLength);
    }

    return(TRUE);
}

//
// GetObjectTitles() - retrieve titles for each of the object
// types from the system registry. The retrieved data, which is
// referred to as the title database, is in the form of a series of
// pairs of ASCII strings. The first string of a pair is the object
// type index in decimal, the second string is the title. The entire
// set of strings is terminated by an extra null byte.
//
//
BOOL GetObjectTitles(VOID)
{
    HKEY hKey;
    char chClass[10];
    DWORD dwType;
    DWORD cSubKeys;
    DWORD cbMaxSubkey;
    DWORD cbMaxClass;
    DWORD cValues;
    DWORD cbMaxValueName;
    DWORD cbMaxValueData;
    DWORD cbSecurityDescriptor;
    DWORD cbClassSize = 10; // sizeof(chClass);
    FILETIME ftLastWriteTime;

    // get handle for subkey holding object type indexes and titles
    if(ERROR_SUCCESS != RegOpenKeyEx(HKEY_LOCAL_MACHINE,
        "Software\\Microsoft\\Windows NT\\CurrentVersion\\Perflib\\4d9",
        0, KEY_QUERY_VALUE, &hKey))
    {
        MessageBox(hFrame, "RegOpenKeyEx failed!", szAppName,
            MB_ICONSTOP | MB_OK);
        return(FALSE);
    }

    // get maximum size of value data for values reached thru this subkey
    if(ERROR_SUCCESS != RegQueryInfoKey(hKey, chClass, &cbClassSize, NULL,
        &cSubKeys, &cbMaxSubkey, &cbMaxClass, &cValues, &cbMaxValueName,
        &cbMaxValueData, &cbSecurityDescriptor, &ftLastWriteTime))
    {
        MessageBox(hFrame, "RegQueryInfoKey failed!", szAppName,
            MB_ICONSTOP | MB_OK);
        RegCloseKey(hKey);
        return(FALSE);
    }

    // bump maximum data size value for safety
    cbMaxValueData++;

    // allocate memory to hold the incoming data
    pTitles = malloc(cbMaxValueData * sizeof(TCHAR));

    if(pTitles == NULL)
    {

```



```

    MessageBox(hFram, "GetObjectTitles malloc failed!", szAppName,
        MB_ICONSTOP | MB_OK);
    RegCloseKey(hKey);
    return(FALSE);
}

// now retrieve the index and title data
if(ERROR_SUCCESS != RegQueryValueEx(hKey, "Counters", NULL, &dwType,
    (LPBYTE) pTitles, &cbMaxValuesData))
{
    MessageBox(hFram, "RegQueryValueEx failed!", szAppName,
        MB_ICONSTOP | MB_OK);
    RegCloseKey(hKey);
    return(FALSE);
}

// release the handle for the subkey
RegCloseKey(hKey);
return(TRUE);
}

//
// FindTitle() -- look up the object type index in the title database
// that was read by GetObjectTitles(). Return a pointer to the title
// string if a match is found, otherwise return a pointer to "Unknown".
//
PSTR FindTitle(INT TitleIndex)
{
    INT i; // scratch object index
    PSTR p = pTitles; // start of title database

    while(*p)
    {
        i = atoi(p); // convert index string
        p += strlen(p) + 1; // point to title string

        if(i == TitleIndex) // is this desired index?
            return(p); // yes, return addr of title string

        p += strlen(p) + 1; // no, go to next index
    }

    return("Unknown"); // no match was found
}

```

```
// FindGroup() -- Searches for the object group which has the
// specified title. Returns pointer to the beginning of the group's
// instance storage if match is found, otherwise a NULL pointer.
//
PPTRPGROUP FindGroup(PSTR GroupName)
{
    INT iCurGroup;
    PPERPGROUP pCurGroup;

    // point to the first group of objects
    pCurGroup = pFirstGroup;

    // compare title for each object type against supplied string
    for(iCurGroup = 0; iCurGroup < iTotGroups; iCurGroup++)
    {
        // if titles match, return pointer to first instance
        if(!strcmp((PSTR) pCurGroup->ObjectNameTitle, GroupName))
            return(pCurGroup);

        // advance to next group of objects
        pCurGroup = (PPERPGROUP) ((PBYTE) pCurGroup +
            pCurGroup->TotalByteLength);
    }

    return(NULL); // no match was found
}

//
// FindCounterName() -- look up the magic number for the counter type
// in the structure counterNames[], return a pointer to a string.
//
PSTR FindCounterName(DWORD CounterType)
{
    INT i;

    for(i = 0; i < dim(counterNames); i++) // look up counter type
    {
        if(counterNames[i].Code == CounterType)
            return(counterNames[i].Name); // match was found
    }

    return("Unknown Counter Type"); // no match was found
}
```

The other two parts of the object type block are strongly interrelated. Each object instance within a particular object type block has the same format and contains a size field, a pointer to the instance's name (for example, a process name), a pointer to a parent object, and a unique identifier (dependent on the object type), followed by a series of counters. The counter definitions section con-

You can probably tell by now that writing a program that dumps out the performance data block in a raw, unsorted format would be a straightforward task. The program would need to do little more than jump from pointer to pointer, stopping at each piece of instance data and displaying the instance's name, object type, and counters with the aid of strings from the Titles Data-

Once you've written that first basic program, there are many enhancements you can add. Locating the instances for a particular type of object at the user's request would make the program significantly more useful, but significantly more complex as well. The program would have to scan the Titles Database first to look for a match for the object name, extract the corresponding index, and then search the performance data block for an object type block with a matching index. You wouldn't want to hardwire the object type names or indexes into the program, because they might well change from one release of the operating system to another. And unraveling and displaying the relationships between the different kinds of objects—for example, threads and their parent processes—would move the program completely out of the "toy" realm and make it something you'd actually want to keep around.

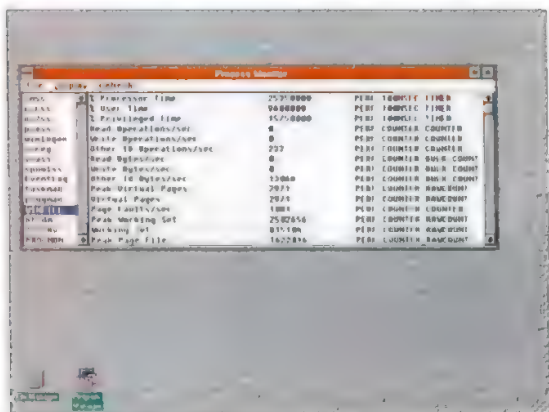
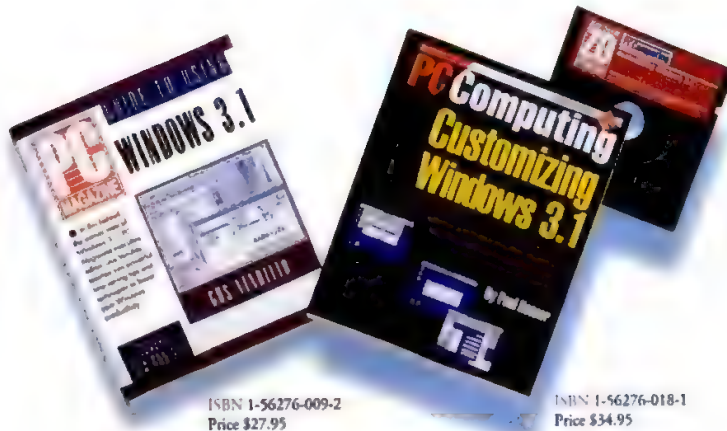


Figure 3: This shows PROCMON in action, displaying a list of processes in the left window and a list of counters for a selected process in the right window.

Windows 3.1, Plus 2.



ISBN 1-56276-009-2
Price \$27.95

ISBN 1-56276-018-1
Price \$34.95

Microsoft Windows 3.1 plus two new books from *PC Magazine* and *PC/Computing* add up to smarter computing and new heights of productivity—whatever your skill level. The world-renowned experts at *PC Magazine* and *PC/Computing* share their insights in these two exciting books, both written fresh for Windows 3.1:

PC Magazine Guide to Using Windows 3.1: The ultimate how-to guidebook from *PC Magazine* contributing editor Gus Venditto. Scores of illustrations and hands-on examples will have you using all the supercharged Windows 3.1 features in record time.

PC/Computing Customizing Windows 3.1: Make Windows 3.1 work the way you do. *PC/Computing* senior editor Paul Bonner helps you customize existing Windows applications and write your own programs—even if you've never programmed before.

Available at fine bookstores, or call

1-800-688-0448

ext. 1319



© 1992 Ziff-Davis Press

THE PROCMON SAMPLE PROGRAM For this issue's sample program, I've modified last issue's SYSMON program to display per-process counter information; I've called the new version PROCMON. Extracts from the source code for PROCMON are shown in Figure 2, and a screenshot of PROCMON in action can be seen in Figure 3. The full source code, resource script, make file, and executable can be downloaded from the Programming Forum on PC MagNet, archived as PROCMO.ZIP.

From the user's point of view, PROCMON's main window is divided into two child windows. The left window contains a list of processes that are derived from the performance data block. When the user clicks on a process name, the counters that are associated with that process are displayed in the right window. Both of the child windows are scrollable and are refreshed at 10-second intervals when PROCMON is running in the background (when it doesn't have the input focus). The size and location of the main PROCMON window are saved in a private .INI file from one execution of the program to the next.

The source code for PROCMON is considerably simpler than either of the predecessor SYSMON programs because PROCMON doesn't do its own painting of text or maintain its own scrollbars. Instead, since you can expect the lists of both processes and counters to be fairly short, I decided to rely on the predefined LISTBOX control class for display of the data rather than creating child windows. (Of course, controls are windows, too, but they are windows of a special, predefined, global class with a window callback procedure that is buried somewhere in one of the Windows NT DLLs.) PROCMON controls what text is displayed in the LISTBOXes by sending messages. While this doesn't produce a very elegant-appearing application, it is quite a powerful technique when you need to build an interactive and robust utility program in a hurry.

THE IN-BOX Please send your questions, comments, and suggestions to me at any of these addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

Internet: duncan@cerf.net ☐

COPY SOFTWARE ILLEGALLY AND YOU COULD GET THIS HARDWARE ABSOLUTELY FREE.



Software piracy isn't just a crime. It's a shame. Because most people who do it aren't even aware that it's illegal. If you copy software that's protected by copyright, you could lose your job, face a civil suit, pay a \$100,000

fine and possibly be imprisoned. So get the facts now. To request more information, contact the Software Publishers Association at 1-800-388-7478. Because in a court of law, ignorance is one thing you won't be able to plead.

Please send me more information on the legal use of software

Name _____

Organization _____

Title _____

Address _____

City _____ State _____ Zip _____

Please check software format you prefer if you would like to receive SPAudit, a software inventory management tool:

☐ DOS 3.3 ☐ DOS 5.25 ☐ Macintosh®

Mail to: Piracy Update, 1720 M Street, N.W.,
Suite 700, Washington, D.C. 20036-4610

T-1

SPa Don't Copy That Floppy

Macintosh is a registered trademark of Apple Computer, Inc.

DUSTIN DOES CD-ROM

Smart and Friendly

- Great Price on a fast, reliable drive.
 - 2 Year Warranty!
- Get Bundle Prices on listed titles with purchase of CD-ROM Drive**

CD-900 Series

Data access: 375 MS
Data transferability: 150 KB/SEC
32 KB Memory Buffer • MPC Compliant

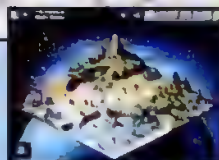
\$309
Internal



\$59

Microsoft Cinemania
Everything you ever wanted to know about the movies

- 19,000 movie listings
- 3,000 biographies
- Dialogue and movie stills



\$69

The Animals!
A multimedia adventure in the animal kingdom.
See and hear over 200 exotic mammals, birds and reptiles in terrific video/sound technology.



\$99

Street Atlas USA
Detailed, street-level maps of the entire USA on one CD-ROM
Every street in the USA is included!
• Location by street name, phone exchange or zip code

Software

	REG	BNDL
Amanda Stories MPC	49	35
Amer. Bus. Phone Book	NA	15
Animals, The	69	29
Annabel's Dream MPC	59	NA
Audobon's Mammals	39	15
Bible Library	59	15
Birds of America	39	15
Carmen San Diego	75	45
CD Game Pack II	59	35
CD Storytime Vol 1	NA	15
Chessmaster MPC	59	29
CIA World Fact Book	55	35
Corel Draw	399	NA
Corel Draw Vers Upgrd	145	NA
Corel Draw Comp Upgrd	235	NA
Desert Storm MPC	35	25
DTPPro	NA	15
Great Cities/World	75	29
Grips 2	45	29
Grolier's Multimedia Encyclopedia Pack	265	NA
Jones in the Fast Lane	49	35
Kings Quest V	49	35
Loom	59	35
Mavis Beacon MPC	59	29
Microsoft Cinemania	59	NA
Microsoft Encarta	269	NA
Microsoft MM Beethoven	59	NA
Microsoft Bookshelf	139	NA
Microsoft Video	139	NA
Microsoft Works MM	139	NA
Microsoft Publisher	139	NA
Microsoft Office	499	NA
Mixed Up Mother Goose	49	35
MM Toolbook	535	NA
Monarch Notes	69	NA
Monkey Island	49	35
Ocean Digital Imagery	45	35

	REG	BNDL
Grips 2	45	29
Grolier's Multimedia Encyclopedia Pack	265	NA
Jones in the Fast Lane	49	35
Kings Quest V	49	35
Loom	59	35
Mavis Beacon MPC	59	29
Microsoft Cinemania	59	NA
Microsoft Encarta	269	NA
Microsoft MM Beethoven	59	NA
Microsoft Bookshelf	139	NA
Microsoft Video	139	NA
Microsoft Works MM	139	NA
Microsoft Publisher	139	NA
Microsoft Office	499	NA
Mixed Up Mother Goose	49	35
MM Toolbook	535	NA
Monarch Notes	69	NA
Monkey Island	49	35
Ocean Digital Imagery	45	35

	REG	BNDL
Monkey Island	49	35
Ocean Digital Imagery	45	35
Playing with Language Series (each)	55	29
Publish It! 2.0	99	25
Shakespeare on Disc	29	15
Shareware Gold II	59	35
Sherlock Holmes	49	35
Sound Works	45	25
Stellar 7	49	35
Street Atlas USA	99	NA
Time Table of History	59	15
Toolworks Bundle Plus	NA	75
Toolworks Reference Lib	85	29
US Atlas MPC	NA	29
US Atlas w/Automap	59	45
Ultima I thru VI	69	49
World Atlas MPC	89	49
Call for Items not Listed		
Hitachi CDR1700 External	629	

Drives

	BNDL
Hitachi CDR1700 External	629
Hitachi CDR3700 Internal	519
NEC CD Express	429
NEC CDR-74 External	649
NEC CDR-84 Internal	589
Smart & Friendly CD800 MAC	325
Smart & Friendly CD800e	299
Smart & Friendly CD900e	359
Smart & Friendly CD 900i	309
Smart & Friendly HS1200e	689
Smart & Friendly HS1200i	599
Sony CDU-535 Interface Kit	85
Sony CDU-535 Internal	319

Accessories

Labtec SS700 Speakers	39
Pro Audio Spectrum 16	235
Sound Blaster Pro CD	199
Thunderboard	99
Labtec SS700 Speakers	39
Pro Audio Spectrum 16	235
Sound Blaster Pro CD	199
Thunderboard	99
Labtec SS700 Speakers	39
Pro Audio Spectrum 16	235
Sound Blaster Pro CD	199
Thunderboard	99

SAME DAY SHIPPING
FREE GROUND SHIPPING

Monday thru Friday 6AM to 5PM PST

1-800-274-6611

20969 Ventura Blvd., Ste 13, Woodland Hills, CA 91364



Plain Wrap Prices,
Black Tie Service.

CIRCLE 168 ON READER SERVICE CARD

FOR FREE CATALOGUE
& ANY ITEMS NOT LISTED

FAX your order 24-hours

1-818-884-5310

Prices subject to change without notice



The Purchasing Source for Direct Buyers

- 2,500 products to choose from
- Dozens of America's Top Direct Marketers
- Great Value for Your Money
- Service & Support Experts
- Fast Delivery



INDEX

Systems

Acma Computers, Inc.	393
Agatech/ Mitac	404
Ariel Designs, Inc.	402
CompuAdd Express	367
Comtrade	375
Edge Technology	396
EPS Technology	376
Expo Tech	394
FASTMICRO	359
Grid OnLine Express	385
Hyundai Electronics	400
Insight Computers	347
Olympic Computer Technology	403
PCs Compleat	418
Quill Corporation	383

Santron Computers	372
Tangent Computer, Inc.	356
Tri-Star Computers	398
US Systems & Technologies	378
USA Flex	386

Software/Peripherals/Components

Arlington Computer Products	416
Buffalo Products	436
Bulldog Computer Products	434
CompUSA	437
Compuclassics	417
Computability	407
Computer Discount Warehouse ..	410

Computer Express	430
Dustin Discount Software	346,354
FAST MICRO	414
First Source International	426
Global Horizons	441
H Co. Memory Upgrades	435
Hard Drives International	352
Hunter Computers	425
LA Trade	432
Landmark	409
Midwest Computer Works	424
Pacific Wave (Paradise)	433
PC Zones	422
Peripheral Express	431
TELEMART	428

COMPUTER SYSTEMS

Insight

486 EISA & Local Bus

**Insight Computers
keep you ahead.**

Insight 486



Fully Upgradable Intel® 80486 CPU
EISA 32 Bit Bus Architecture
4MB RAM - 256K Cache
170MB 12ms Hard Drive w/cache
340MB with Stacker®
32 Bit EISA Controller
Non-Interlaced 14" Super VGA
Color Monitor
24 Bit 1MB Graphics Accelerator
Super VGA Video Card -
Up to 16 Million Colors
1.2MB 5.25" Floppy Drive
1.44 MB 3.5" Floppy Drive
2 Serial 16550 Ports, 1 Parallel Port
Enhanced 101 Key Keyboard

MS-DOS® 5.0

Mouse

Desktop Case, Full Vertical Available
Stacker and Dr. Solomon's
Anti-Virus™ Software

486-33MHz

\$1,999

486-50MHz

\$2,299

486DX2-66MHz

\$2,499

**SUPER
BUY!**



Insight 486 Ultimate



Fully Upgradable Intel 80486 CPU
EISA 32 Bit Bus Architecture
8MB RAM - 256K Cache
520MB 12ms Hard Drive w/cache
1040MB with Stacker
32 Bit EISA Controller w/ 2MB Cache
Non-Interlaced 14" Super VGA
Color Monitor
24 Bit 1MB Graphics Accelerator
Super VGA Video Card -
Up to 16 Million Colors

1.2MB 5.25" Floppy Drive
1.44 MB 3.5" Floppy Drive
2 Serial 16550 Ports, 1 Parallel Port
Enhanced 101 Key Keyboard
MS-DOS 5.0
Mouse
Ultimate Full Vertical Case Standard
with 300 Watt Power Supply
and Dual Cooling Fans
Stacker and Dr. Solomon's
Anti-Virus™ Software

486-33MHz

\$3,199

486-50MHz

\$3,499

486DX2-66MHz

\$3,699

**SUPER
BUY!**

Thank You!

**Inc.
500**

Inc. Magazine names Insight the 5th
fastest growing private company in the
United States! Insight would like to
thank all it's loyal customers.
We couldn't have done it without you!

The Inc. logo is a registered trademark of Goldhirsh Group, Inc.

486 Local Bus System

Insight 486 Local Bus



Fully Upgradable Intel 80486 CPU
VESA Standard Video
8MB RAM - 64K Cache
210MB 12ms IDE Hard Drive w/cache
420MB with Stacker
32 Bit Local Bus 1MB Graphics
Accelerator Super VGA Card
32 Bit Local Bus IDE Controller
Non-Interlaced 14" Super VGA
Color Monitor

1.2MB 5.25" Floppy Drive
1.44 MB 3.5" Floppy Drive
2 Serial Ports, 1 Parallel Port
Enhanced 101 Key Keyboard
MS-DOS 5.0 - Mouse
Desktop Case, Full Vertical Available
Stacker & Dr. Solomon's
Anti-Virus™ Software

486-33MHz

\$2,199

486-50MHz

\$2,399

486DX2-66MHz

\$2,599

**SUPER
BUY!**

Local Bus

Avoid information bottlenecks!
Today's higher resolutions and
increased display colors can tax a
system's performance. Insight's local
bus configuration gives your video and
hard drive top priority so you can get
the most out of Windows.

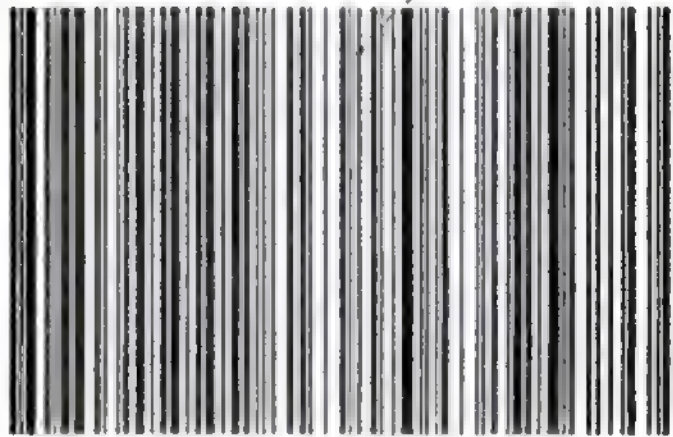
**Technical Support is a
toll-free call away!**



1. Follow instructions on the other side

Back

005511Back-0018



Inverted Back

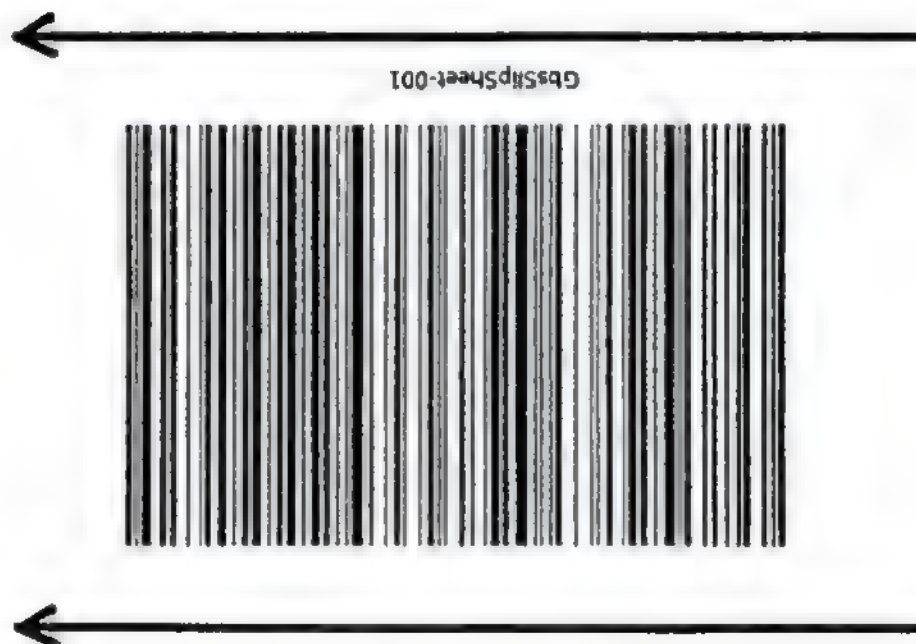
1. Follow instructions on the other side



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

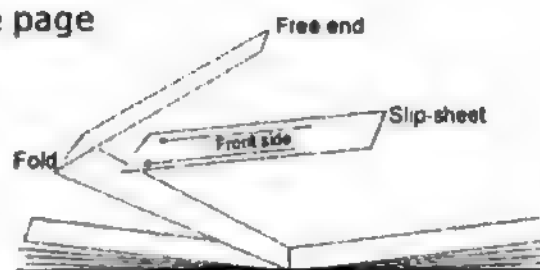
Foldout slip-sheet

Folded edge of the page



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



NOTEBOOKS PRINTERS & SOFTWARE

Insight

The experts
speak: Insight
Computers.

"For a surprisingly
low price, Insight managed
to pull together a very
powerful system."
-PC Magazine 3/17/92

"Whether you're a power
user or LAN administrator,
Insight has a system for you
at a price you can afford."
-Computer Shopper 1/92

"Incredibly fast...faster in
both benchmark testing and
subjective observations of
daily usage."
-PC Sources 8/91

"...too fast to verify with
benchmark tests...the Insight
was measurably faster at
operations like loading large
database files, performing
sorts, and scrolling through
word processing documents."
-PC Sources 5/91

"Best price in the roundup,
fast, lots of slots and bays..."
-PC World 6/92

"Solid, spacious
construction -- plenty of
room for expansion..."
-Computer Shopper 10/92

Notebooks

TOSHIBA



386sx-20MHz

T1800

2MB RAM - Expandable to 10MB,
60MB Hard Drive (120MB
w/Stacker), VGA LCD Display

\$1,579

386sx-25MHz

T1850

4MB RAM - Expandable to 12MB,
80MB Hard Drive (160MB
w/Stacker), VGA LCD Display

\$1,939

COMPAQ

LTE 386S/20

Notebook

386SX 20-MHz CPU 4K Cache
2MB RAM - Expandable to 10MB
80MB Hard Drive (160 w/ Stacker)
11.0 x 8.5 x 2.2" - 7.5 Pounds
1.44MB 3.5" Floppy Drive
VGA Edgelit Display
101-/102-Key Compatible Kbd.
NiCad Battery Pack & AC Adapter
1 Serial & 1 Parallel Port
Ext. VGA Port & Keyboard Port
MS-DOS 5.0 & Stacker Software

\$1,599

PRINTERS

Canon Printers

Canon



Desktop Bubble Jet

BJ-200 **\$339**
BJ-300, 600CPS **\$419**
BJ-330, 600CPS, W-carriage **\$579**
BJC-800, 300CPS, color **\$1,899**

Laser

LBP 4sx **\$899**
LBP 8sx **\$1,339**

Portable Bubble Jet

BJ-10EX **\$289**

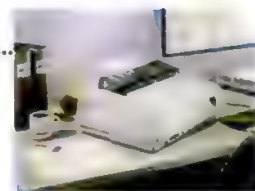
NEC Printers 24-Pin Pinwriter Printers with 360DPI

Narrow Carriage

P3200 - 8K, up to 216 CPS **\$229**
P6200 - 80K, up to 300 CPS **\$409**

Wide Carriage

P3300 - 8K, up to 216 CPS **\$329**
P6300 - 80K, up to 300 CPS **\$629**
P9300 - 80K, up to 400 CPS **\$829**



Texas Instruments Printers TEXAS INSTRUMENTS

TI Microlaser

9ppm, 512K RAM, exp. to 4.5MB,
2 font cartridge slots, parallel inter-
face, 250 sheet paper cassette,
handles paper up to 8.5x14 and
envelopes, user upgrade to true
Adobe PostScript, 300 dpi. **\$879**

TI Microlaser PS17

Same as TI Microlaser, w/1.5MB
RAM, & 17 font Adobe PS. **\$1,199**

TI Microlaser PS35

Same as TI Microlaser, w/1.5MB
RAM, & 35 font Adobe PS. **\$1,399**

Microlaser PS35 Turbo

9ppm, RISC coprocessor, 35
scalable Adobe PS fonts, 2.5MB
RAM, exp. to 10.5MB, parallel
interface, serial/Appletalk opt, 250
sheet paper cassette, handles legal/
envelopes/labels, emulates HP
LaserJet, 1yr. warranty **\$1,599**

SOFTWARE

Software Best values - 1000's more titles in stock!

Corel Draw 3.0	\$369	Microsoft Office 3.0	\$459	Paradox 4.0	\$499
Desqview X	159	Microsoft Word 2.0	295	Peachtree Complete.6.0	175
Lotus 1-2-3 3.1+	379	Norton Desktop Windows 2.0	109	Procomm Plus Windows	79
Lotus Smart Suite	419	Norton Utilities 6.01	109	Quattro Pro Win+DOS	299
Microsoft Excel 4.0	295	PageMaker 4.0 Windows	489	WordPerfect Win. or DOS	255

[illegible]

COMPUTER SYSTEMS

Insight

Faster than a speeding bullet!

Insight 486



Fully Upgradable Intel® 80486 CPU
4MB RAM - 64K Cache
210MB 12ms IDE Hard Drive w/cache
420 with Stacker®
Non-Interlaced 14" Super VGA
Color Monitor
24 Bit 1MB Graphics Accelerator
Super VGA Video Card -
up to 16 Million Colors
1.2MB 5.25" Floppy Drive
1.44 MB 3.5" Floppy Drive
2 Serial, 1 Parallel, & 1 Game Port
Enhanced 101 Key Keyboard
MS-DOS 5.0 - Mouse
Full Vertical Case
with 250 Watt Power Supply
& Dual Cooling Fans Standard
8 Expansion Bays, 6 Exposed
Stacker and Dr. Solomon's
Anti-Virus™ Software

486SX-25MHz

\$1,599

486-33MHz

\$1,899



486DX2-50MHz

\$1,999

486-50MHz

\$2,099

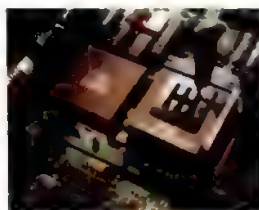
486DX2-66MHz

\$2,299

No time to wait for a fully-loaded, value-packed '486? No problem! We've specially configured and pre-built our hottest-selling Insight Computers and they're ready to ship!



Shift your 486DX or SX into OverDrive!



Boost your system performance up to 70% with an OverDrive™ Processor from Intel.

All Insight 486DX & 486SX Computers come standard with an OverDrive™ socket for easy upgradability.

Call for details!

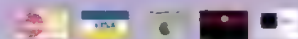
Get your Insight Computer Super Direct™!

Super products & selection.

- '486 ISA, EISA & Local Bus Computer Systems
- '386 Computer Systems
- Notebooks
- Hard Drives
- Removable Drives
- Monitors & Printers
- CD-ROM Drives & software
- Tape Backups & Memory Networking Products
- Uninterruptible Power Supplies
- Software

Super service.

- 30-Day Worry-Free Guarantee
- Federal Express Delivery
- Toll-Free Technical Support 7 Days a Week
- Payment Options Galore



- 24-Hours Ordering
- One Year Parts & Labor Warranty/Replacement Policy
- Special National Accounts Department for Larger Customers.

Super value.

The combined buying power of Insight and Hard Drives International keeps your system's cost **ROCK BOTTOM** without compromising quality!

800-998-8041

Insight

Buy the
Super
Direct™
way!

HARD DRIVES

HARD DRIVES
International

Insight

PC
MAGAZINE
EDITORS' CHOICE

June 27, 1989
Mass Storage Mail Order



*From the
storage specialists.*

Western Digital Free Stacker with all Western Digital Hard Drives. Stacker instantly and safely doubles your hard disk capacity!

WESTERN DIGITAL

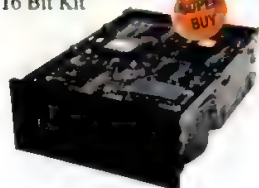


85MB 170MB w/ Stacker	IDE	125MB 250MB w/ Stacker	IDE	170MB 340MB w/ Stacker	IDE
Western Digital WD280A, 15ms 3.5" 1"H Bare Drive Kit 8 Bit Kit 16 Bit Kit	\$239 \$279 \$259	Western Digital WD2120A, 14ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$309 \$329	Western Digital WD2170A, 12ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$349 \$369
210MB 420MB w/ Stacker	IDE	340MB 680MB w/ Stacker	IDE		
Western Digital WD2200A, 12ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$399 \$419	Western Digital WD2340A, 12ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$649 \$699		

Fujitsu

420MB	IDE/SCSI	510/520MB	IDE/SCSI	42MB	IDE	106MB	IDE
Fujitsu FJ2623A/S, 12ms 3.5" HH Bare Drive Kit 16 Bit Kit (IDE) 16 Bit Kit (SCSI)	\$949 \$969 \$1,099	Fujitsu FJ2624A/S, 12ms 3.5" HH Bare Drive Kit 16 Bit Kit (IDE) 16 Bit Kit (SCSI)	\$999 \$1,019 \$1,149	Seagate ST351A, 28ms 3.5" 1"H Bare Drive Kit 8 Bit Kit 16 Bit Kit	\$169 \$189 \$189	Seagate ST3120A, 15ms 3.5" 1"H Bare Drive Kit 8 Bit Kit 16 Bit Kit	\$279 \$319 \$299

1080MB	SCSI
Fujitsu FJ2266S, 14.5ms 5.25" FH Bare Drive Kit 16 Bit Kit	\$1,499 \$1,649



Bare Drive Kits Include:
All mounting hardware and HDI's
Hard Drive Reference Manual with
complete installation instructions.

8 & 16 Bit Kits Include:
Host adapter hard/floppy "1 to 1"
controller or interface card, mount-
ing kit, rails, cables, all mounting
hardware and HDI's Hard Drive
Reference Manual.

32 Bit Kits Also Available!

245MB	IDE/SCSI
Seagate ST3283A/N, 12ms 3.5" 1"H Bare Drive Kit (IDE) Bare Drive Kit (SCSI) 16 Bit Kit (IDE) 16 Bit Kit (SCSI)	\$499 \$599 \$519 \$749

Micropolis

660MB	SCSI
Micropolis MC1624, 15ms 5.25" HH Bare Drive Kit 16 Bit Kit	\$1,199 \$1,349

Maxtor

130MB	IDE
Maxtor MX7120A, 15ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$309 \$329

Conner

40MB	IDE
Conner CP3000, 25ms 3.5" 1" H Bare Drive Kit 8 Bit 16 Bit Kit	\$179 \$219 \$199

Talon Free Stacker!

120MB 240MB w/ Stacker	IDE
Talon TA3020A, 16ms 3.5" 1" H Bare Drive Kit 8 Bit Kit 16 Bit Kit	\$279 \$319 \$299



1350MB	SCSI
Micropolis MC1528-15, 14ms 5.25 FH Bare Drive Kit 16 Bit Kit	\$1,799 \$1,949

210MB	IDE
Maxtor MX7213A, 15ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$419 \$439

170MB	IDE
Conner CP30174A, 17ms 3.5" 1"H Bare Drive Kit 16 Bit Kit	\$359 \$379



Bernoulli by MEGA®

Your drive will grow with you if you change systems or platforms. And, only Bernoulli is endorsed by 99 percent of its owners!

Bernoulli features a 75,000-hour MTBF rate, proven head-crash resistance and disks that withstand an eight-foot drop! Up to 360MB with Stacker.®

360MB Removable Media Kit

Bernoulli, the best name in removable media, offers a 90 Pro internal drive, full SCSI adapter, up to 360MB of storage, 2 90MB cartridges and Stacker® disk compression software.

360MB Internal Kit	\$499
Extra Cartridges	\$149
Tri-Pack Cartridges	\$419



Each drive includes 2 cartridges!

**BERNOULLI
MEANS SECURITY
FOR YOUR DATA**

Other Iomega Products

PC Powered 90 Pro Kit	\$599
MacTransportable Kit	\$559
PC2B Interface Card	\$199

CD-ROM Ask about multimedia kits!

Talon SUPER BUY!

TA-100*

Internal, 380ms access time, 32KB buffer, fast transfer rate, headphones and software. \$279

Talon High Performance TA-200*

Internal, 280ms access time, 64KB buffer, 300KB/second transfer rate, headphones and software. \$549

*Free with these CD-ROM drives-

New 1992 Toolworks Multimedia Encyclopedia
21 volume set. 33,000 articles w/3,000 pictures, 250 maps, 35 min of video, 35 min of sound and 55 video sequences.

Reference Library
Webster's New World™ Dictionary, New York Public Library™ Desk Reference, and six other useful references.

Game Pack II
CD Stereo Headphones

CD Software - Pick 5 for \$99*

Aircraft Encycl.	Mavis Beacon Typing
Bible Library	N. American
Career Opportunities	Indians/Nat'l Parks
CIA Factbook	Plant Doctor
Civil War	Space-Apollo
European Monarchs	Timetable Sci.
Guinness Disc	USA State Factbook
Great Cities (MM)	US Civics
Interactive Storytime	US Presidents
KGB Factbook	Vietnam
Korea	World War II

*with purchase of a CD-ROM Drive or multimedia kit

Sony

S-31A*

Int, 490ms access time, 64KB buffer, fast transfer rate, headphones and software. Photo CD compat. \$399



Tape Backups Standard QIC 80 attaches to existing floppy controller or dedicated unit, w/ data compr. 2-3MB/min.

Talon SUPER BUY!

Archive

120MB inc. one tape	\$189
250MB inc. one tape	\$249



QIC interface, includes drivers for Novell and DOS.
250MB Internal \$799
250MB External \$899

DAT SCSI - 16 bit, includes drivers for Novell and DOS.
1300MB Internal \$1,595
1300MB External \$1,795

Colorado

120MB	\$199	250MB	\$259
-------	-------	-------	-------

WangDAT

DAT Tape Backups SUPER BUY!

WangDAT is the premier name in Digital Audio Tape backup systems. These compact units offer the speed and reliability necessary for high capacity tape storage for DOS, Novell and UNIX-based systems. Now Super Direct™ Priced!

Internal kits - 3.5" with 5.25" frame, 16 Bit controller card, cable, software, mounting hardware and tape included. External kits - external case, 16 Bit controller card, cable, software, SCSI interface, tape included.
2GB 3100 Internal 16 Bit Kit \$1,199
4GB 3200 Internal 16 Bit Kit \$1,399
4GB 3200 External 16 Bit Kit \$1,499

Networking

Complete! Everything you'll need to network 2 PCs is included!

LANTastic Ethernet Starter Kits

Two 16-bit Artisoft AE-2 or AE-3 Ethernet adapters (ISA), LANTastic Network Operating System (2-300 nodes), 25' coax cable, 2 T-connectors, 2 terminators, hardware and software documentation.

AE-2™ Ethernet Starter Kit	\$479
AE-3™ Ethernet Starter Kit	\$549

Windows versions available.

Extra AE-2 Boards	\$199
Extra AE-3 Boards	\$239

ARTISOFT

Revolutionizing Connectivity

Novell

All versions and upgrades available at the lowest prices.



Memory

SIMM

1MB	x9 80ns	\$call
1MB	x9 70ns	\$call
256KB	x9 70ns	\$call
4MB	x9 70ns	\$call

We have memory for every system and printer. Call for updated pricing!

FAX 602-350-1150

Corporate - Gov't - Educational
800-927-2907

APO/FPO/International
602-350-1145
FAX 602-350-1188

8041

800-998-8041

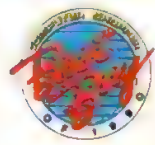
Insight

Buy the
Super
Direct™
way!

Prices and availability subject to change without notice. All items are NEW. POs accepted from qualified buyers. Net 20. APO/FPO orders add \$16 for US Post Express Mail. POs, 30-Day Guarantee and 1-Year Replacement Policy may have some restrictions. Shipping is non-refundable. All trademarks are the properties of their respective owners. Intel Inside is a registered trademark of Intel Corporation. Leasing available for businesses. 1/26/93

ACC PAC BPI Series	255	255	PC Anywhere 4.5	45	33	Mathematica 386 Windows	839
ACC PAC Simply Windows	135	69	Host/Remote	69	49	Sigma Plot	429
DAC Easy Accounting 4.2	105	135	Procomm Plus 2	135	95	Statgraphics 5.1	689
DAC Easy Accounting Upgrade	49	195	Procomm Plus V	195	35	Systat Dual	745
DAC Easy Bonus Pack	135	359	Q-Modem	359	CALL	Personal Training Systems	195
DAC Easy Payroll 4.2	69		Remote 2 (Host & Caller)		39	Prep for the SAT	129
Individual Stock Investor	69		Smartcom III		49	Science Adventure	1099
M Y O B Windows	149		Smartterm		39	Space Adventure	29
Managing Your Money 8.0	39		Wildcat BBS		79	Spanish Assistant	39
Money for Windows	55		Winfax Pro		95	Sports Adventure	39
Peachpay	55		WordPerfect Office PC		89	Type I	235
Peachtree Accounting (Windows)	189		Faxit! For Windows		CALL	Typing Tutor V DO	529
Peachtree Basic Accting	85		Lantastic Products		109	Vista P	649
Peachtree Complete	199		Laplink Pro 4.0				585
Point-of-Sales Acctng	245		Laplink Pro Upg				CALL
Quickbooks	95		Novell Products		45		125
Quickbooks/Quickpay	125		PC Anywhere 4.5				235
Quicken 6.0	49		Host/Remote				119
Quicken Windows	49		Procomm Plus				199
Sales Order Acctng	245		Procomm Plus V				199
Timeslips III	199		Q-Modem				99
Turbo Tax Federal	CALL		Remote 2 (Host & Caller)				35
Turbo Tax State	CALL		Smartcom III				CALL
Willmaker 4.0	45		Smartterm 420 For Windows				95
			Wildcat BBS				185
			Winfax Pro				CALL
			WordPerfect Office PC				CALL
			ARAGO DBXL 1.3				499
			ARAGO Quicksilver 1.3				149
			Clanion Personal Develo				359
			Clipper				399
			DataEase Express				389
			DataPerfect				129
			DB Fast Windows				109
			DBase IV				299
			Family Tree Maker				CALL
			FileMaker Pro Window				58
			Foxbase Plus				139
			Foxpro 2.0				65
			Foxpro 2.0 F				489
			Instant				135
			Laplink Pro 4.0				75
			Laplink Pro Upgrade				155
			Novell Products				49
			PC Anywhere 4.5				155
			Host/Remote				155
			Procomm Plus 2				155
			Procomm Plus V				155
			Q-Modem				155
			Remote 2 (Host & Caller)				155
			Smartcom III				155
			Smartterm				155
			Wildcat BBS				155
			Winfax Pro				155
			WordPerfect Office PC				155
			ARAGO DBXL 1.3				155
			ARAGO Quicksilver 1.3				155
			Clanion Personal Develo				155
			Clipper				155
			DataEase Express				155
			DataPerfect				155
			DB Fast Windows				155
			DBase IV				155
			Family Tree Maker				155
			FileMaker Pro Window				155
			Foxbase Plus				155
			Foxpro 2.0				155
			Foxpro 2.0 F				155
			Instant				155
			Laplink Pro 4.0				155
			Laplink Pro Upgrade				155
			Novell Products				155
			PC Anywhere 4.5				155
			Host/Remote				155
			Procomm Plus 2				155
			Procomm Plus V				155
			Q-Modem				

QUICK & EASY CANADIAN DELIVERY





Hot Stuff for '93



6 EDITORS' CHOICE AWARDS!

486-33MHz Localbus

An exceptional Windows performer with 32-bit VESA localbus graphics accelerator for exceptional video!

- Intel i486SX-33 microprocessor
- 4MB RAM
- 64K SRAM memory cache
- 170MB 15ms fast IDE hard disk
- 1.44MB floppy drive
- 32-bit VESA localbus graphics accelerator & 14" color monitor

\$1,495

486-66MHz Burner

More processing power for your computing dollar. Without question, the industry's best 66MHz value!

- Intel i486DX2-66 microprocessor
- 4MB RAM
- 64K SRAM memory cache
- 170MB 15ms fast IDE hard disk
- 1.44MB floppy drive
- 32-bit VESA localbus graphics accelerator & 14" color monitor

\$1,995

EISA LocalBus Blowout

The power of EISA plus lightning-fast Localbus graphics for under \$2,000!

- Intel i486SX-33 microprocessor
- 4MB RAM
- 64K SRAM memory cache
- 170MB 15ms fast IDE hard drive
- 32-bit EISA caching controller
- 1.44MB floppy drive
- 32-bit VESA localbus graphics accelerator & 14" color monitor

\$1,895

EISA POWERHOUSE

The most-awarded 486 EISA power platform - with a new 45 Winmark 32-bit graphics accelerator for '93!

- Intel i486DX2-66 microprocessor
- 8MB RAM with 256K cache
- 200MB 15ms fast SCSI hard disk
- 32-bit EISA caching controller
- 1.44MB floppy drive
- 45 Winmark 32-bit graphics accelerator & 14" color monitor

\$3,295

100MHz 64-Bit

Ready-to-run Windows NT, UNIX and UnixWare - 2X faster than a 486-66! A software developer's dream machine!

- 100MHz 64-bit microprocessor
- 16MB RAM (up to 256MB)
- 200MB 15ms fast SCSI hard disk
- Localbus SCSI, Ethernet & audio
- four 32-bit EISA slots
- 1.44MB floppy drive
- Internal CD-ROM drive
- 64bit localbus 1280x1024 graphics controller & 14" monitor

\$9,995

66MHz Disk Array

Our 1993 MultiServers double the performance at half the cost! Custom server solutions for NetWare, UNIX, DOS/Windows, OS/2 or NT. Ask about our new VAR program.

- One to ten 486-66 processors!
- 16MB to 256MB RAM
- 400MB to over 400GB storage
- Industry-leading 17.5MB/s of continuous DTR
- 1-3ms continuous access time
- Multi-buffered disk I/O
- Ethernet or 100Mb twisted pair

servers from \$5,000

Get Your Money's Worth!

Tangent's all-new 1993 models offer more value, performance and customer support for your computer system or network investment than anyone else. With Tangent you order directly from SCO, Novell, Windows and OS/2 certified engineers that can set you up with complete networks supporting up to 1,000 nodes! And, if you're looking for the best workstations the industry has to offer, we've got them too!

Call Tangent for A Winning Deal Today!

Talk to one of our experts and see for yourself why you just won't lose with Tangent. The best products. The best performance. *Your best choice.*

800-800-6060



TANGENT
COMPUTER

CORPORATE PURCHASE ORDERS WELCOME • GSA# GS00K91AGS5212

197 Airport Boulevard, Burlingame, CA 94010

415/342-9388 • FAX 415/342-9380

All models available with a full range of CPU, memory and disk options. All specifications and prices subject to change without notice.

© Copyright 1992 Tangent Computer Corporation. TCS 1/93PCMB All trademarks are owned by their respective companies. Intel is a registered trademark of Intel Corporation.

CIRCLE 045 ON READER SERVICE CARD

Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

Peripherals

CONFIGURING DEVICES

❓ I'm having trouble getting my serial mouse (which is attached to a multifunction I/O card) and my fax modem to work at the same time. Can you help?

George Taylor
New York, New York

► **PC MAGAZINE:** Troubleshooting communications problems isn't easy. Part of the difficulty is that the designers of the original PC didn't foresee the need for more than two serial devices and therefore limited the number of IRQs to 8. The number of IRQs was increased to 16 with the AT's 16-bit bus, but COM ports could still use only 6 since they are 8-bit devices. As a result, you can run into problems when you try to use more than two devices on a fully configured system.

A convention has developed to define the assignments for COM3 and COM4 in which they share the interrupts with COM1 and COM2 respectively. Thus COM1 and COM3 use IRQ 4, and COM2 and COM4 use IRQ 3. But sharing an IRQ works only if the two devices are not active at the same time. If, for instance, you've assigned your mouse to COM1 and your modem to COM3 and the two ports share IRQ 4, the two devices can't work together.

It's also possible that the problem isn't related to IRQs; COM ports have I/O address settings as well. Again, standard assignments have developed for the four COM ports. They are the following:

COM1: 3F8h
COM2: 2F8h
COM3: 3E8h
COM4: 2E8h

The obvious solution would seem to be to assign one of your devices to COM1 and the other to COM2 since, by convention, these two ports share neither IRQs nor I/O addresses. Unfortunately, not all boards follow the convention. If the

Our Advisors

Douglas Beiling is a contributing editor and the author of many utilities, including MBOOT.COM and EMS40.SYS.

Frank J. Dorfner, Jr., is senior networking editor and the author of the *PC Magazine Guide to Connectivity*.

Alfred Peor is a contributing editor and the author of the *Hewlett-Packard LaserJet Printer Handbook*.

Jeff Pressise is a contributing editor and the author of the *PC Magazine Guide to DOS 5 Memory Management*.

Sal Ricciardi is a contributing editor and the author of the forthcoming *Running FoxPro* books from Microsoft Press.

Nell J. Rubenking is technical editor and the author of two Turbo Pascal books and *PC Magazine DOS Batch File Lab Notes*.

Joe Salemi is a contributing editor and the author of the *PC Magazine Guide to Client/Server Databases*.

Luisa Simone is a contributing editor and the author of the book *Microsoft Publisher*.

Craig Stinson is a contributing editor and coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and coauthor of *Word for Windows Companion, Second Edition*.

Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

COM port on the multifunction card and the one on the fax modem both are set to use the same I/O address, then resolving an IRQ conflict won't solve the problem. And this may not be an option on your system if, for instance, COM2 is already in use by another device or if you have a card (such as a sound card or scanner interface) that doesn't use a COM port at all but does use IRQ3. To add to the confusion, one of your boards could be malfunctioning.

Your best option is to develop a test

strategy that involves reducing the configuration to a known combination that works, then adding back elements one at a time until you isolate the problem. Programs like System Sleuth Professional from Dariana Inc. can identify which IRQs and I/O ports are in use, but it's almost as easy to do it yourself. You can begin by testing to see what combinations work. Here's the idea: Start by removing the modem card and enabling the COM2 port on the multifunction card. Configure the mouse driver for COM2, plug the mouse into the COM2 port, and verify that the port works with the mouse. Then disable the port and verify that the mouse no longer works.

Put the modem card back in and configure it for COM1 with the conventional IRQ and I/O port settings. Verify that the modem works. Now reenable the COM2 port on the multifunction card. Does the mouse work? Does the modem? Will they work together?

If, say, the modem card doesn't work with this configuration, remove the multifunction card. If the modem works, the multifunction board could be the source of the problem. But if the modem still doesn't work, there may be something wrong with the modem card's configuration or circuitry.

You can check the I/O port assignments for conflicts using the DOS DEBUG utility. Load the program—which will respond with a dash as a prompt—and give the command

D 40:0 L 8

INDEX

Peripherals

Configuring devices 357

Operating Environments

Drag-and-drop 358

Word Processing

Centering lines 366

Using exact line spacing 366

Spreadsheets

Graph-Show macro for 1-2-3 374

@If and labels in Quattro Pro 384

Databases

The Harless

Color Sets 384

Graphics

Predicting PostScript

problems 392

Networking

Checking RPRINT-ER—again 392

The airport phone modem mystery 392

Languages

Turbo Pascal objects 399

This will list the four port addresses, with each pair of bytes representing one address in byte-reversed order. For example, a system with three COM ports with the correct assignments will produce this result:

```
0040:0000 F8 03 F8 02 E8 03 00 00
```

Type Q and press Enter to leave DEBUG. If you see a conflict, check your boards' documentation for the settings for the I/O port assignments.

Take a look at "Assigning IRQs" that appeared in the December 22, 1992, Solutions column for more information on configuring the devices in your system.
—Alfred Poor

Operating Environments

DRAG-AND-DROP EDITING

TIP The Windows 3.1 File Manager is better than you might first think, but it does lack a general text edit function. True, you can double-click on a text file you earlier associated with an editor, but this fails for any unexpected file type, and it bombs completely for DOS batch files because they begin to run when you double-click on them. File Manager has no command to edit them.

All is not lost, however. To add an editing function to File Manager, I first copied the two most important Windows editors, NOTEPAD.EXE and WRITE.EXE, to names that appear first in the name sort order: !NOTEPAD.EXE and !WRITE.EXE. Then I opened a second directory window by double-clicking on the drive C: symbol, chose the Windows directory, shut down the directory tree part on the left, and reduced the size so that only the two editor copies remained visible. I positioned the window in the lower right of the File Manager parent window, so that it's out of the way and doesn't cover the main directory display. Finally, I held down the Shift key and double-clicked on the system button in the very upper left corner to save the new configuration.

Now every time I call up File Manager it appears with the new window already in place. If I want to edit a batch or other

text file, I drag and drop it on !NOTEPAD.EXE, or on !WRITE.EXE for my longer files.

You could consider adding PIF-EDIT.EXE too, because Program Information Files also start running rather than just opening for editing when you double-click on them.

*Hans-Georg Michna
Munich, Germany*

► **PC MAGAZINE:** When you double-click on an executable file (that is, a file with the extension .COM, .EXE, .BAT, or .PIF), File Manager executes the file. If the double-clicked file has any other extension, File Manager looks in the *Extensions* section of your WIN.INI file to see whether that extension is associated with a program. If so, it executes the program, passing the name of the data file on the command line. You can create new associations at any time using the File | Associate command in File Manager.

Text files, however, have all kinds of different extensions: .INI, .TXT, .DOC, .ASC, even .ME!. It doesn't make sense to associate every possible text file extension with NOTEPAD.EXE or WRITE.EXE. There are just too many possibilities. It's a lot easier to simply drag the desired file and drop it onto NOTE-

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Or maybe you'd like a better understanding of how something works. If so, we invite you to let us know about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

U.S. Mail: Solutions, *PC Magazine*, One Park Ave., New York, NY 10016. (Please send a floppy disk along with a printout.)

Fax: 212-503-5799

MCI Mail: Solutions, 556-3896

CompuServe Mail: 72241,104

PC MagNet: Select Submissions to PC Magazine from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.

CompuServe Members: If you're a CompuServe member, you can join PC MagNet by typing GO PCMAG at any CIS prompt.

For any tip we print, you'll receive \$50 plus a *PC Magazine* T-shirt.

PAD.EXE or WRITE.EXE. Forcing copies of these two programs into a special tiny window within File Manager makes it easy to drop files onto them.

After creating the copies !NOTEPAD.EXE and !WRITE.EXE and opening a second File Manager window, adjust the display mode for that window. If the files are not sorted by name, select View | Sort by name. Click on View | By File Type and uncheck the check box next to Directories. If you see more than one filename on a line, select View | All File Details. Finally, select View | Directory Only to eliminate the tree display. Single-click on !NOTEPAD.EXE to highlight it, and then shrink the window; make it as narrow as possible and just high enough to show the two filenames. Highlighting !NOTEPAD.EXE forces File Manager to keep it visible as you shrink the window.

Each time you drop a text file on !NOTEPAD.EXE or !WRITE.EXE, File Manager will ask for confirmation with a message like "Are you sure you want to start !NOTEPAD.EXE using AD.CFG as the initial file?". You can suppress this message by selecting Options | Confirmation and turning off the check box labeled Mouse Action.

You can also drop files from File Man-

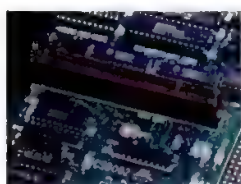
FastMicro Finally Puts the 486 in Its Rightful Place!



Inside the New FastMicro 486/Pro!

Dual VESA Standard!

Settle for everything! While a few computer companies give you VESA local bus and even fewer give you a VESA standard monitor, FastMicro includes both!



VESA Standard Local Bus!

Why settle for slow video performance? FastMicro includes a high performance Windows accelerator combined with a VESA standard local bus!

Why is Local Bus faster? The i486DX is a high speed (33+ MHz) 32 bit processor. Video cards plug into a slot in your PC, called a bus connector. The standard PC bus was designed for an 8 MHz 286, therefore it's confined to 8 MHz and 16 bit. FastMicro's VESA Local Bus runs at 33MHz and 32 bit. Turn on your 486/Pro and watch Windows scream!

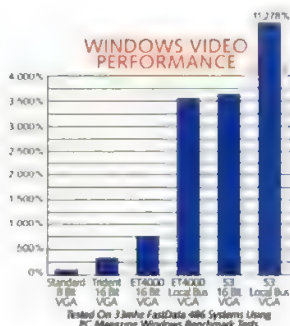
Why VESA? VESA Local Bus is a standard, unlike a proprietary local bus. You can upgrade your system in the future with third party VESA standard local bus peripherals. With your 486/Pro from FastMicro, you're not locked in.

Plus True Color Video!

No video card delivers more! FastMicro gives you the maximum number of colors possible for scanning, graphics, presentations and desktop publishing. Many systems can only do 256 colors, some can do 32,000 colors, FastMicro takes you to the limit with 16.7 million colors maximum!



FastMicro Combines VESA Local Bus Performance with Windows Acceleration & over 16 Million Colors!



VESA Standard Flicker-Free Monitor!

Non-Interlaced monitors are not created equal. A non-interlaced monitor with less than a VESA standard refresh rate will flicker at high resolution modes! The resolution is the number of pixels (or 'dots') on the screen, the refresh rate is the speed in which the monitor redraws the screen. Don't be fooled.



VESA Standard Refresh Rates at 640x480, 800x600, & 1024x768!

Your new 486/Pro system from FastMicro includes VESA standard refresh rates at 640x480, 800x600, and 1024x768! Compare and don't settle for less, if other systems don't say it, they won't do it!

20% Larger Display with Edge-to-Edge Video!

In addition to eliminating annoying flicker when running in high resolution modes, FastMicro doesn't make you look at tiny characters either! Our new VESA standard display includes Edge-To-Edge video! 14" monitors are not created equal. You see, 14" is strictly the tube size, not the display area. FastMicro 486/Pro monitors are user adjustable for width, height, and position - just set to your preference and forget it.

You get more useable screen area than many 15"



Standard Non-Interlaced Monitors



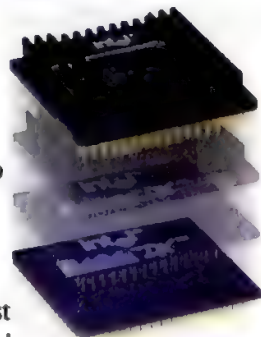
FastMicro Edge-To-Edge Video!

monitors. Edge-To-Edge video is really a lifesaver when running at 800x600 or 1024x768 Super VGA modes!

FastMicro Maximizes Performance

Advanced Upgrade Path!

Not only do you get a high performance 486 PC today, but you can upgrade it tomorrow! Put a 33MHz FastMicro 486/Pro system on your desk and when you're ready for even more power, you can pop in an Intel OverDrive™ processor and boost performance even more!



Your 486/Pro system is compatible with Intel's fastest processors so you're assured of state of the art performance now and a growth path tomorrow!

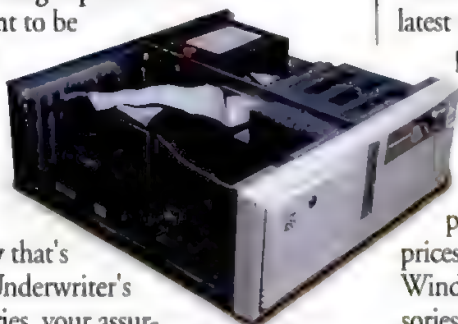
Dual Intelligent Cooling Fans: Only from FastMicro!

Every desktop FastMicro PC comes with dual cooling fans. It has a main fan that's quieter than fans in ordinary PCs - plus it includes a special second fan that comes on only when the system gets warm. A cooler system lasts much longer - a concern particularly when upgrading to higher heat-producing clock doubler chips.



Fourth Generation Case

Our desktop case is uniquely engineered to provide the highest quality and maximum expandability in a space saving design. It has a total of seven drive bays to accommodate all of the storage options our customers tell us they want to be able to add in the future. It also has extra protection against electrical interference, unlike the weaker systems others sell. It also includes a



power supply that's listed by Underwriter's Laboratories, your assurance of quality by America's most prestigious safety organization.

Conner 212Mb Higher Performance Drive.

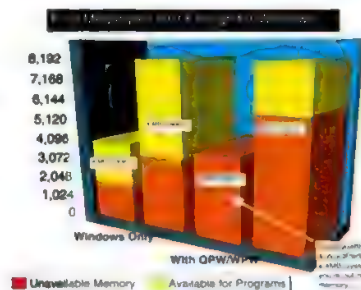
FastMicro ups the ante with Conner's CP-30204 212mb IDE hard drive standard in 486/Pro systems. Conner has a reputation for building the most reliable drives on the market. Couple this with a 12 millisecond access time and up to 8MB/sec. data transfer rate and you won't want to gamble on a less reputable drive. No wonder Conner is now the #1 manufacturer of hard disks in the world!



CONNER

Eight Megabytes of Memory!

Running Windows? Don't run out of memory! When Windows runs low on memory, it starts using your hard drive like memory. Memory is 200+ times faster than a hard drive - don't get caught short! FastMicro includes a full eight megabytes of RAM in every 486/Pro system.



Start with FastMicro, Stay with FastMicro.

Why call one company to order your PC and another for everything else? FastMicro is the only leading system vendor that also advertises a full line of software, peripherals and more to complete your system and keep you abreast of all the latest technology products to maximize your computing productivity.

Four times a year, we'll send you our informative catalog featuring over five hundred PC products at low FastMicro prices. It features everything from Windows software to books, accessories to networking, and printers to games. FastMicro is truly your one-stop shop!



FastMicro 486/Pro Series - Don't Settle for Less!



4DX/33

\$1999

4DX2/66

\$2399



- i486™ Processor with 8K Internal Cache.
- High Speed 128K External Static RAM Write-Back Cache.
- Upgradable to Overdrive Processors.
- 8 megabytes of high speed RAM.
- 212mb 12ms Conner IDE hard disk.
- 1.2mb 5.25" & 1.44mb 3.5" Toshiba floppy drives.

- VESA Local Bus SVGA Windows Accelerator Card with 16.7 Million Colors Maximum.
- VESA Standard Non-Interlaced 14" Super VGA color monitor with 800x600 @ 72hz & 1024x768 @ 70hz and Edge-To-Edge Video.
- Dual Intelligent Cooling Fans.
- Clock calendar, parallel port, game port and two serial ports.
- 8 expansion slots, 2 occupied.
- Fourth Generation Desktop Case.
- 200 Watt UL Listed Power Supply.
- Microsoft DOS.
- Microsoft Windows 3.1
- Microsoft Serial Mouse.
- Choice of Two Major Software Applications: WordPerfect for Windows, Quattro Pro for Windows, Paradox, PC Tools and/or Graphics Works for Windows.
- FastMicro Peace of Mind.

Legendary FastMicro Service

FastMicro backs up all FastData PC's with the most comprehensive service in the business. Seven day a week toll-free technical support is included for as long as you own your FastData PC. In the unlikely event a part should



GE Computer Service

fail during the one year warranty, we'll express ship you the replacement part. If we still can't resolve the problem, we'll send GE on-site or replace the system

at no charge.

Satisfaction Guaranteed

We'd love to add you to the FastMicro family of satisfied customers.

Every FastData 486 PC comes with our 30 day money back satisfaction guarantee.

But if you're like the majority of our customers, you'll be very satisfied. After all, at FastMicro, we want you as a customer for life - not just today.



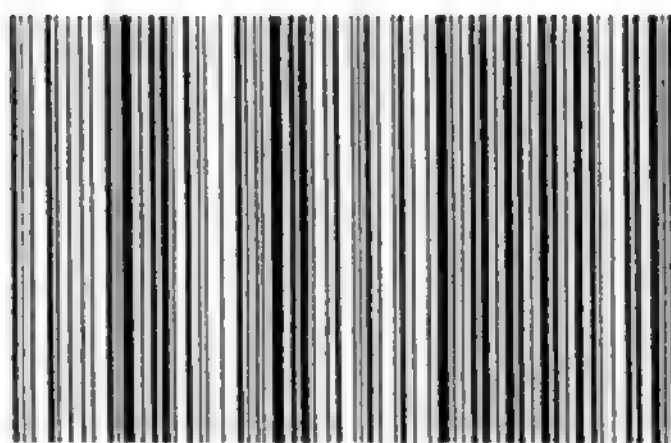
© 1992 FastMicro, Inc. 4405 E. Baseline Rd. Phoenix, AZ 85044. All major credit cards accepted. Prices and money back guarantee do not include 3% shipping. i486, Intel Inside, and OverDrive are trademarks of Intel Corporation. All other trademarks acknowledged.

FASTMICRO 1-800-824-6000

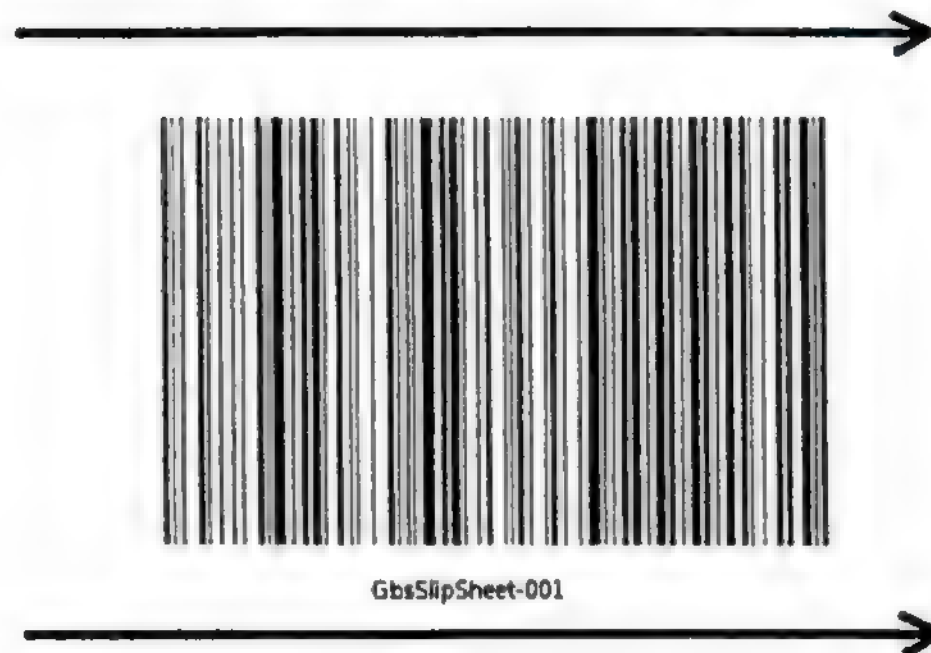
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



GbsSlipSheet-001



Folded edge of the page

Inverted Foldout slip-sheet

1. Open the foldout page

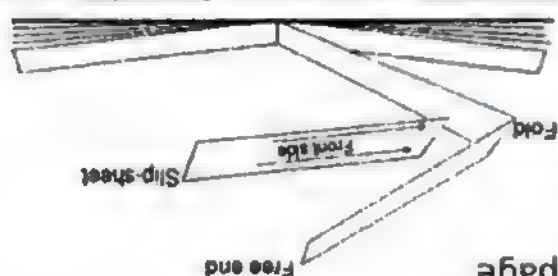
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

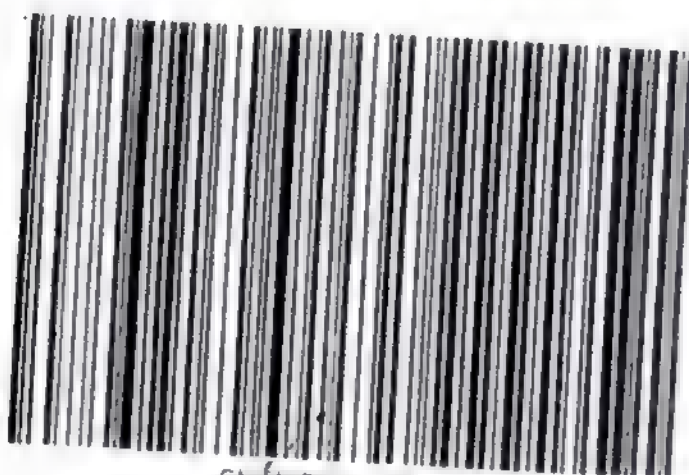
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

High Performance Software Included Too!

Start with Windows & a Genuine Microsoft Mouse!

With FastMicro 486/Pro systems you get more! Of course you get the latest versions of Microsoft DOS and Windows pre-installed. But unlike most of our competitors, we include a true Microsoft mouse, not the lowest price mouse we could find.



Take Two - Get up to \$700 Worth of Software

The best computer deserves the best software and FastMicro includes some of today's hottest software at no extra charge! Choose any two of the following titles and you'll get the latest versions complete and ready to run. Everything's included and you get full manufacturer support (unlike some other 'bundles'). The products come in special FastMicro boxes - retail boxes shown.



WordPerfect for Windows

WordPerfect is the #1 selling word processing software and the Windows version is loaded with features. It includes the ability to create & edit tables, equations, lists and graphics. You can even edit graphics created

with other programs! Plus, it works with your WordPerfect for DOS files and uses familiar WordPerfect commands so your transition to Windows is easy.

PC Tools 8.0

The latest version of the top selling utility software! PC Tools 8.0 adds an all new DOS desktop with integrated application menu & manager, file viewer & manager, scheduler, and desk accessories. You also get Central Point's award-winning backup and a hot new version of Anti-Virus. PC Tools also includes DiskFix, FileFix, Undelete, Unformat, Disk Edit, Defragmenter, Cache and more! Central Point Commute lets you remotely run Windows or DOS applications and you get new RamBoost Memory Optimizer too!

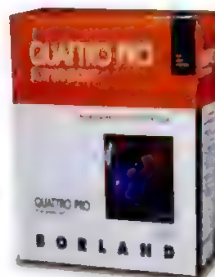


Quattro Pro for Windows

"Quattro Pro for Windows is worth the wait" proclaims PC Magazine. QPW uses spreadsheet notebooks to easily organize your spreadsheets. Click your right mouse button and Object Inspectors lets you change attributes instantly! Speedbars give you those one-click shortcuts that

change depending on what you're working on! Interface Builder lets you build applications without programming.

"QPW comes with a separate Database Desktop application - a beautifully designed query-by-example tool" says PC Magazine, "QPW's graphs are gorgeous and include rotatable 3-D types as well as options to adorn them." Need we add more?



Paradox 4.0

Paradox is the most advanced relational database ever created for the PC. Now it's the fastest. For first time users or application developers, Paradox provides the ease of use and power you need! New

Application Workshop, Paradox's application generator, lets you easily

develop custom applications. Paradox also has automatic multiuser support and is network ready. Combine this with the full suite of development tools and SQL connectivity and Paradox is the database of choice!

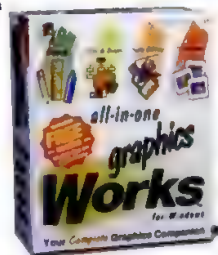


Graphics Works for Windows

With five applications in one, Graphics Works from Micrografix gives you complete graphic tools for Windows.

Includes Windows Draw! - the hot selling package that lets you create graphics compatible with your other

Windows programs. It also includes new Photo Magic! - the photo editing software that comes with hundreds of photos you can or modify and use in you documents (plus you'll have photo realism on-screen with FastMicro's true color video). You get a charting tool and the leading organization charting software for Windows. Plus you get a bonus CD with over 1,000 photos and 10,000 pieces of clip art you can use as-is or customize with Graphics Works!



Why settle for less?
FastMicro includes the real thing: a Microsoft Mouse.



True Intel 486 for Less Than \$1,000!



Introducing FastMicro's 486/Valueline.

Don't need all the extra features of our 486/Pro Series? Then the 486/Valueline is right for you. This system is truly a price breakthrough! FastMicro delivers a high performance 486 system at a low end price. Others can only offer a 386/SX for less than \$1000 or substitute an imitation 486 that's more like a 386. FastMicro puts 25MHz 486SX power in your hands. Plus this isn't a 'bare' system, you get a system that's complete and ready-to-run right out of the box, including a Super VGA color monitor and card.

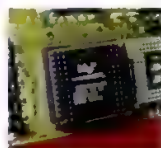
Loaded with Memory & Storage

FastMicro also includes four full megabytes of high-speed SIMM memory! You can even expand the memory to a total of 32MB. Of course, how can you also expect to get a hard drive at this price? Well, FastMicro includes a quality Conner hard drive with an unbelievable 85MB capacity. Plus, since it's a standard IDE drive, you can easily add a second hard drive later.



Upgradable to Overdrive Processors!

The best part of this system is that you get legendary FastMicro upgradability too! Besides upgrading the memory and drive, you can upgrade later to a faster Intel processor. This system is completely Intel OverDrive™ compatible; which means you can upgrade your FastData 486 system all the way to a 66 MHz 486DX/2! And like all FastMicro systems, you can upgrade monitors, drives, etc. when you order.



Plus, It's from FastMicro!

Pay less and get more! FastMicro backs up this system with seven day a week toll-free technical support and express parts replacement at no extra charge. And should you have an unusual problem, we'll send GE on-site service or replace the system at no additional cost! We also include BBS support and a 30 day money-back satisfaction guarantee too! Try a FastMicro 486/Valueline PC, you'll agree that they offer a lot of power for the price.



GE Computer Service



4SX/25 \$999

- i486SX™ 25mhz Processor with 8K Internal Cache & 64K Static Ram Cache.
- 486 Overdrive™ Processor Upgradable.
- 4 megabytes of high speed RAM.
- 85 mb 17ms IDE hard disk.
- 1.44mb 3.5" floppy drive.
- Mini-Tower Chassis.
- 14" SVGA monitor, 1024x768 resolution.
- 16 bit SVGA card.
- Clock calendar, parallel port, game port and two serial ports.
- 6 expansion slots, 2 occupied.
- Microsoft DOS 5.0.

FASTMICRO

1-800-824-6000

© 1992 FastMicro, Inc. Prices and money back guarantee do not include shipping. FastMicro 486/Value models do not include extras that 486/Pro models do.



Now You Can Get The Answers To Software Questions When You Need Them!



The most comprehensive and complete source of technical support information — on all the leading PC

software applications — is now available on a single CD-ROM.

To make certain that Support On Site is always the latest and most complete source of support information anywhere, every month a new, complete and updated compact disc is delivered directly to you.

WHAT DOES IT DO?

Support On Site helps you solve software problems quickly and simply. Its key uses are:

- Handling conflicts between products.
- Identifying the solutions to error messages.
- Configuring software.
- Obtaining the latest drivers and ancillary software.
- Providing information on advanced techniques.

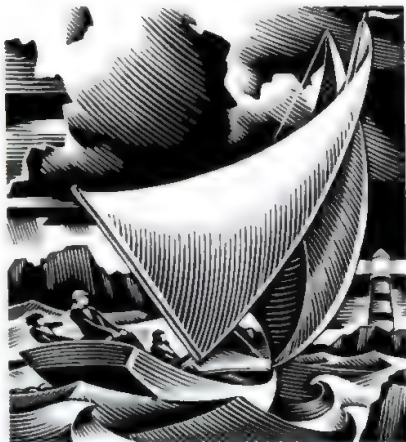
RIGHT AT YOUR DESK

Support On Site puts hundreds of functions and services that were outside your organization on site — right at your support desk.

EASY ACCESS

Support On Site combines extensive technical and operational software information in one quick, search-and-retrieve program. Nothing could be easier and no special training is needed.

Type the word or phrase that describes your problem, and the entire database is quickly searched. The information appears in front of you on the screen.



Support On Site™

FAST ANSWERS

No more hunting through manuals, waiting for 800# operators, searching bulletin boards or paying expensive computer consultants. You get the answers in seconds.

WHERE DOES THE INFORMATION COME FROM?

Support On Site puts software publishers' manuals and technical notes — that, until now, were not available — as well as information from Cobb Newsletters, reference books by Que and Ziff-Davis Press and tech notes from industry sources on your desktop. It is the most comprehensive, single source of technical support information on the leading PC software applications available anywhere.

Support On Site even includes proprietary software — drivers, patches, bug fixes and macros — directly from software publishers.

WHO NEEDS IT?

- HELP Desks
- End-User Computing Professionals
- Information Center Personnel
- MIS/DP
- Computer Resellers
- Independent Support Companies
- PC Vendors

SUPPORT FOR MAJOR APPLICATIONS

Aldus®	Symphony®	PowerPoint®
Aldus® PageMaker®	Freelance Graphics™	Quartus®
Berland®	Freelance Graphics™	DesqView™
dBase®	for Windows	QEMM™
Quattro® Pro	Ami Pro™	Software Publishing
PARADOX®	Microsoft®	Harvard Graphics™
MultiMate®	MS-DOS®	Symantec®
Central Point Software	Microsoft® Windows™	Q&A™
PC Tools®	Microsoft® Excel®	WordPerfect
Fox Software	Microsoft® Word®	WordPerfect®
FoxPro™	Word® for Windows™	WordPerfect®
Lotus	Word® for Windows™	WordStar®
Lotus® 1-2-3®	Microsoft® Works®	WordStar®
Lotus® 1-2-3® for Windows™	Microsoft® Works® for Windows™	

CALL NOW FOR FREE DEMO DISK

Find out how quick, easy and comprehensive Support On Site is — call today for a FREE demonstration disk. No obligation. No commitment. But lots of information.

1-800-827-7889 ext. 312



FAST ANSWERS TO SOFTWARE QUESTIONS

COMPUTER LIBRARY
CIRCLE 009 ON READER SERVICE CARD

QUICK!

You can answer these questions in seconds.

1. Should you run FASTOPEN AND SMARTDRV concurrently?
2. How should you configure DESQview 386 to run with Lotus 1-2-3?
3. What causes a "Cannot load COMMAND.COM" message in DOS 5.0?

ager's directory listing onto running copies of NOTEPAD.EXE or WRITE.EXE, but this causes the new file to replace any file currently loaded in the editor. Dropping the file onto the editor's .EXE filename within File Manager starts a new copy of the editor to edit that file.—Neil J. Rubenking

Word Processing

CENTERING MULTIPLE LINES IN WORDPERFECT 5.1

TIP For those times when you need to horizontally center multiple lines of text in WordPerfect 5.1, here's a simple macro that will let you do the job with minimal effort:

```
{DISPLAY OFF}
{Format}ljc{Enter}{Enter}
{Format}ljf{Enter}{Enter}{Left}
```

Briefly stated, the macro enters the format code for centered justification followed by the code for full justification, then moves the cursor back one position. Any text you then type will fall between the two codes. Hitting the right arrow key will move the cursor past the second code and move you back to full justification for further text entry.

John D. Sherlock
Kingston, Ontario, Canada

► **PC MAGAZINE:** If you like to see text centered as you type it, this macro offers a small but worthwhile improvement over the Shift-F6 command that enters the [Center] code. Unlike the centered justification code, the [Center] code applies only to text that comes after the code *on the same line*. Centered justifica-

tion applies to all text until the next justification code. (Note that this macro will not work in WordPerfect 5.0, which lacks centered justification.)

There are a few improvements you might like to make in this macro, however, as shown in Figure 1. The least of these is the single [Exit] command that replaces the two [Enter] commands in the original macro but serves the same purpose.

Mr. Sherlock's macro assumes that you haven't yet typed anything that you want to center. In fact, if you are in the middle of a line and run the macro, WordPerfect will insert a soft return before the center justification code, so that you're forced to a new line. In the real world, however, odds are that you will at least occasionally forget to run the macro until after you've started typing the line. The macro in Figure 1 takes that possibility into account.

The macro uses [Home][Home][Left] to ensure that it is at the leftmost position of the current line before entering the first format code, then [Home][Home][Right] to ensure that it is at the rightmost position before entering the second code. It then moves the cursor one position left. If there was no text on the line when you started the macro, this will be the correct cursor position to let you continue typing. If there was text, however, WordPerfect inserts a deleteable soft return ([DSrt]) between the end of the text and the second justification code. This causes the cursor to go to the line after the original text, so that anything you type goes on that second line.

The improved macro handles this problem as follows: The last line in the macro takes advantage of the {SYSTEM} Left command to test the value of the character or code to the immediate left of (just before) the cursor. The number 36864 is the value that the command will

return for a [DSrt] code. (The list of values is in Appendix T—Macros and Merge, Value Tables—of the WordPerfect 5.1 manual.) If the macro finds a [DSrt] code, it moves the cursor one more position left, letting you continue typing at the last character of the previous line.

As always with WordPerfect macros, enter the commands shown in uppercase by typing Ctrl-PgUp at the macro editing screen, highlighting them on the pop-up list, and hitting Enter. Enter commands shown in both upper- and lowercase by typing Ctrl-V, then the appropriate command key (such as F7 for {Exit}). You can download CENTER.WPM from the Utilities/Tips Forum on PC MagNet.

—M. David Stone

USING EXACT LINE SPACING IN WINWORD

TIP Word for Windows provides precise control over line spacing by letting you set the spacing exactly. Simply place the cursor or selection in the paragraph or paragraphs to format, choose Format Paragraph, then choose Exactly in the Line setting list box, enter a setting in the At text box, and choose OK.

Unfortunately, defining line spacing this way sometimes creates a problem. For example, try inserting a multiple line equation in a document formatted with exact line spacing. Set WinWord to View Field Codes (with a check next to the Field Codes choice on the View menu), and you'll see the embed field. But if you set View Field Codes off, so you can see field results instead, you won't see the equation.

The problem is that when you set an exact line spacing, WinWord will not adjust to fit the size of the equation.

To allow WinWord to adjust size, choose any of the other line-spacing options: Auto, Single, 1.5 Lines, or At Least. All of these will automatically adjust line spacing as necessary.

Nancy Macdonald
Tulsa, Oklahoma

► **PC MAGAZINE:** This behavior holds true not just for inserted equations, but for other inserted objects as well, such as WordArt, MS Draw, and MS Chart objects. It also makes a great deal of sense—

CENTER.WPM

Complete Listing

```
{DISPLAY OFF}
{Home}{Home}{Left}{Format}ljc{Exit}
{Home}{Home}{Right}{Format}ljf{Exit}{Left}
{IF}{SYSTEM}left=36864~{Left}{END IF}
```

Figure 1: This centering macro will let you easily enter multiple lines of centered text. It automatically enters the format commands to start and stop centered justification, then places the cursor between the commands. If you have any text on the current line, it will center that line as well, and leave the cursor where you can continue working on the same line.

**WANT TO KEEP UP
WITH CHANGING
TECHNOLOGY?
PICK A NUMBER.**



340

433

425



- AMD 386DXL processor rated at 40MHz
 - 80MB hard drive • 4MB RAM expandable to 32MB
 - 14" Non-interlaced 72Hz HRVGA
 - local bus video
- Upgradable to 433DXL, 425SX, 440DXL, 433DX, 450DX2, 466DX2

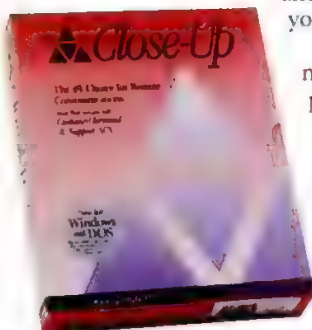
340DX also available in full profile chassis.

The Latest In Technical Support

CompuAdd Express has just introduced the best thing ever to happen to technical support — our Remote Rescue program. Using Close-Up 4.0 remote communication software, our support technicians now can use a modem to talk with your PC and solve problems online.

They'll actually be able to diagnose hardware and setup problems and properly configure your system for you — instead of relaying instructions for you to do it yourself!

Remote Rescue uses Close-Up 4.0, the award winning software program that lets an operator at one system use a modem to view and control



PICK A SCALABLE system from CompuAdd Express, and keeping up with the latest technology is as easy as 1,2,3.

Because upgrading your system as high as the newest 66MHz 486 takes just three quick steps. 1) Pop out your old chip. 2) Pop in a new chip from one of our upgrade kits. 3) Reset your jumpers.

And you're ready to zoom!

CompuAdd Express engineers have combined the best of Intel, AMD and Cyrix processors with our new motherboard design to create seven amazing, upgradable systems. We call them Scalable because, like scalable fonts, they cover an entire spectrum of possibilities.

Express Scalables are ideal for the many computer users whose needs change during the life of their systems. You can tailor a system to your individual needs — no matter where they fall within that spectrum.

The result? Systems that meet the needs of both your work and your pocketbook (where numbers are equally important!). You pay only for the system you need now. But you can transform it into a more powerful unit later.

Express Low Profile Scalable Systems — Ranked By Speed

System	340DX	433DXL	425SX
Processor	AMD 386DXL	Cyrix 486DXL	Intel 486SX
Norton SI Rating	42	53	53
Price	\$1,495	\$1,595	\$1,695

Base System: with 80MB hard drive and 14" NI-HRVGA monitor

another computer. *PC Magazine* called it "The best program you can buy for remote control."

Every new CompuAdd Express system, including notebooks, comes with Close-Up 4.0's Customer/Terminal program installed on the hard drive. All you need is a 2400 baud (or higher) modem. Our notebook computers come with a built-in modem.

CompuAdd Express technicians already solve 90 percent of customers' problems in 5 to 10 minutes. This new program makes our technical support faster and more effective than ever.

So just call when you need help. We'll call back online and take it from there. From here!

440

450

466

- Express Scalable systems contain two processor sockets (for different size chips) and a coprocessor socket on the motherboard.
- To upgrade, just pop out the old chip and pop in the new one — you choose between Intel, AMD and Cyrix — and reset the jumpers.
- On board local bus video and 128KB cache speed your work.
- Other built-in functions include IDE controller, floppy drive controllers, one parallel port, two serial ports and keyboard connections.
- Choose an 80MB, 120MB, 170MB or 200MB hard drive.
- Non-interlaced monitors provide true, 72Hz flicker free display
- Three full size and two half size slots on riser card have room for add-ons.
- 4MB standard RAM is expandable to 32MB.
- Low profile chassis has one 5.25" and two 3.5" drive bays.
- Dual floppy drive leaves room for another hard drive or a tape backup.
- MS DOS 5.0, Windows 3.1 and a serial mouse are included free.
- Full profile Scalables have 64KB cache; six I/O slots; two 5.25" and one 3.5" accessible and two 3.5" internal drive bays; interface for a removable hard drive; accelerated video controller.



- ◆ Intel 486DX2 processor rated at 66MHz
 - ◆ 80MB hard drive ◆ 4MB RAM expandable to 32MB
 - ◆ 14" Non-interlaced 72Hz HRVGA ◆ local bus video
- With 200MB hard drive \$2,395

466DX2 also available in full profile chassis.

440DXC 433DX 450DX2 466DX2

Cyrix 486DXC Intel 486DX Intel 486DX2 Intel 486DX2

64 72 95 132

\$1,695 \$1,795 \$1,995 \$2,145

Our Own Higher Standards

You can count on the people at CompuAdd Express to deliver a top quality computer. And you can count on us for the support and security you want to go with your new system.

■ **30-Day Money Back Guarantee.** If you decide during the first 30 days you don't want your system, you can return it for a refund.

■ **Toll Free Technical Support.** We provide lifetime free telephone assistance — including our new Remote Rescue program, tech support via fax and our technical bulletin board.

■ **Express 30-day Exchange.** During the first 30 days, we'll ship you free replacement system components — even a new system — if we can't fix your problem on the phone.

■ **One-Year Onsite Service.** If you have a hardware problem during the first year with a desktop system that our techs can't solve by phone, we'll ship replacement parts and dispatch a Hewlett-Packard technician to get you up and running fast.

■ **Rapid Repairs.** If we repair your system in our factory (without charge during the first year), we'll have it fixed and back out the door in three working days — or we'll pay for overnight, morning delivery.

■ **Credit Card and Leasing.** With the CompuAdd Express credit card, there are no down payments, and monthly minimum payments are low. Use our leasing program for systems or peripherals.

CompuAdd
Express
800-925-7811

OUR SCALABLE SYSTEMS CHANGE WITH YOUR NEEDS.

Express Scalable 466DX2

- i486DX2 processor rated at 66MHz
- 4MB RAM expandable to 32MB
- 340MB hard drive
- 14" non-interlaced 72Hz HRVGA (1MB memory)
- Local bus video
- Dual floppy drive
- FREE MS DOS 5.0, Windows 3.1, serial mouse

\$2,515

Lease for only \$93/mo.
Full profile also available

Express Scalable 433DLC

- Cyrix CX486DLC processor rated at 33MHz
- 4MB RAM expandable to 32MB
- 170MB hard drive
- 14" non-interlaced 72Hz HRVGA (1MB memory)
- Local bus video
- Dual floppy drive
- FREE MS DOS 5.0, Windows 3.1, serial mouse

\$1,695

Lease for only \$62/mo.
Full profile also available

Express Scalable 340DX

- AMD 386DX processor rated at 40MHz
- 4MB RAM expandable to 32MB
- 120MB hard drive
- 14" non-interlaced 72Hz HRVGA (1MB memory)
- Local bus video
- Dual floppy drive
- FREE MS DOS 5.0, Windows 3.1, serial mouse

\$1,545

Lease for only \$57/mo.
Full profile also available

Express Scalable 450DX2

- i486DX2 processor rated at 50MHz
- 4MB RAM expandable to 32MB
- 200MB hard drive
- 14" non-interlaced 72Hz HRVGA (1MB memory)
- Local bus video
- Dual floppy drive
- FREE MS DOS 5.0, Windows 3.1, serial mouse

\$2,195

Lease for only \$81/mo.
Full profile also available

Upgradable to 466DX2



Express 425CX Low Profile

- Cyrix CX486SLC processor rated at 25MHz
- 4MB RAM expandable to 16MB
- 80MB hard drive
- 14" non-interlaced 72Hz HRVGA (1MB memory)
- Dual floppy drive
- Video accelerator built in on motherboard
- FREE MS DOS 5.0, Windows 3.1, serial mouse

\$1,370

Lease for only \$50/mo.

Express 425CXL Notebook

- Cyrix CX486SLC microprocessor rated at 25MHz
- Math coprocessor built-in
- Over 2 hours of battery life (depending on application, individual use and power management)
- Super-twist backlit liquid crystal display: 9.4" usable
- 64 levels of grayscale
- 9600 baud fax / 2400 baud modem
- Internal IDE hard drive
- 1.44MB 3.5" internal floppy drive
- 4MB RAM
- Built-in mouse trackball
- FREE MS DOS 5.0, Windows 3.1, LotusWorks 3.0, Quick Link II and carrying case

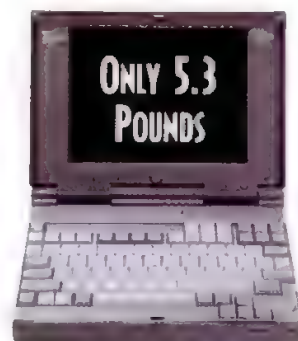
\$2,395

120MB hard drive
Lease for only \$88/mo.

\$2,245

80MB hard drive*
Lease for only \$83/mo.

*While supplies last



Express 325NXL Notebook

- AMD 386SX microprocessor rated at 25MHz
- 80387 coprocessor socket
- 3 to 4 hours of battery life
- Super-twist backlit liquid crystal display: 9.4" usable
- 64 levels of grayscale
- 9600 baud fax / 2400 baud modem
- Internal IDE hard drive
- 1.44MB 3.5" internal floppy drive
- 4MB RAM
- Built-in mouse trackball
- FREE MS DOS 5.0, Windows 3.1, LotusWorks 3.0, Quick Link II and carrying case

\$1,895

80MB hard drive
Lease for only \$70/mo.

\$1,695

60MB hard drive*
Lease for only \$62/mo.

EXPRESS SUPER STANDARDS

With every CompuAdd Express system, you get:

- 30-day money back guarantee
- Express 30-day exchange
- One-year onsite service warranty on desktop systems
- One-year limited warranty covering replacement or repair of defective hardware

CompuAdd Express

TO ORDER, OR FOR INFORMATION ON
OUR FULL LINE OF DESKTOP SYSTEMS, CALL

800-925-7811

12301 Technology Boulevard, Austin, Texas 78727 - Hours 8am-6pm (CST) M-F 512-219-1800 Fax 512-219-2890

We accept MasterCard, VISA, CompuAdd Express Charge, money orders, certified checks (please allow ten days for processing), CODs (minimum order \$50), company and institutional purchase orders (minimum initial purchase \$250, thereafter \$50 with approved credit) and wire transfers. Shipping charges are calculated according to weight and distance. Texas residents, please add appropriate local sales tax. CompuAdd Express will replace or repair defective hardware, software and consumable items. A 15 percent restocking fee may be charged. All return items must be accompanied by a return merchandise authorization (RMA) number. 30-day money-back guarantee does not include return freight or shipping and handling. Opened software and other consumables are nonrefundable. CompuAdd Express sells and services equipment within the United States only and will pay no customs, duties or tariffs on returned merchandise. Prices and product descriptions are subject to change without notice. CompuAdd Express is not liable for damage due to omissions or typographical errors. A copy of our limited warranty is available prior to sale from your sales representative. Pre-installed MS DOS 5.0, Windows 3.1, LotusWorks 3.0 and Close-Up 4.0 are OEM versions.

CIRCLE 128 ON READER SERVICE CARD

Find Everything You'll Ever Want To Know About Computer Products All In One Place!

IT SAVES TIME AND MONEY

Computer Select helps you make the right purchasing decisions — and avoid costly and time-consuming mistakes. It quickly provides all the information you need to identify, evaluate and select exactly the computer products that meet your particular needs.

- Identify the products that perform specific tasks.
- Compare the performance characteristics of competing products.
- Evaluate the suitability of products to your current operating environments.
- Obtain a wide range of expert opinion concerning each product.
- Keep up with the latest product and technology advances.
- Discover valuable tips and techniques to improve the performance of your existing products.

IT'S CONTINUALLY UPDATED

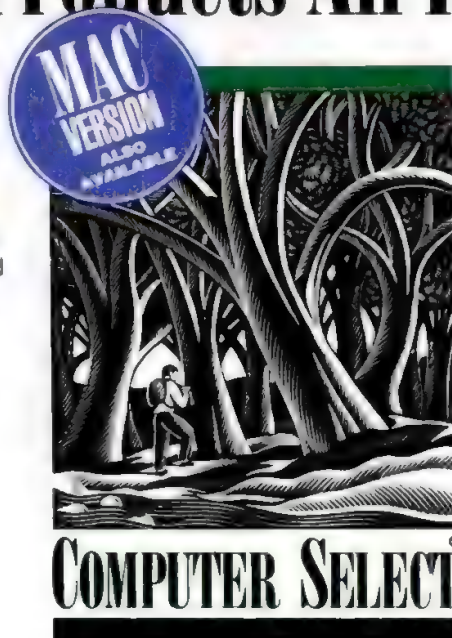
Computer Select is recognized throughout the industry as the most comprehensive and complete source of computer product information — including software applications, hardware and communications devices.

Available on a single CD-ROM, it is constantly being improved and expanded.

To make certain that Computer Select is not only the most complete, but the latest source of product information, subscribers are sent an updated disc every month.

IT'S FAST

Computer Select puts hundreds of publications and tens of thousands of articles right at your desk — right at your finger-tips. But with Computer Select's unique search-and-retrieve



program you can get the exact information you need quickly.

Merely type the word or combination of words that describe what you are looking for and the entire database is searched. The information appears on your screen in seconds.

IT'S COMPREHENSIVE

Computer Select gives you immediate access to tens of thousands of product reviews and analyses — an entire year's worth of articles, updated every month. The information comes from leading industry publications such as *PC Magazine*, *PC Week*, *InfoWorld*, *MacUser*, *LAN Times* and *LAN Technology* — over 170 in all!

In addition, Computer Select incorporates all the reference information from *Data Sources*, the foremost directory of computer products and companies. It also contains electronic versions of Alan Freedman's *Computer*

Glossary and Harry Newton's *Telecom Dictionary*. That means you get:

- 12 months of information from 170 leading computer publications.
- Specs on over 72,000 hardware, software and data communications products.
- Profiles, addresses and phone numbers of 13,000 computer companies.
- Definitions for 11,000 computer and telecommunication terms.

WHO NEEDS IT?

Computer Industry Managers
Purchasing Agents
Information Center Personnel
Hardware and Software Marketers
PC Vendors
MIS/DP Managers
Computer Resellers
Independent Support Companies
Universities and Trade Schools

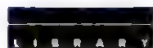
"In ten minutes, Computer Select can give me sixty pages of in-depth reports on whatever I need to know about — ISDN, SONET, video conferencing or multimedia."

William Tyler, New York Telephone

CALL NOW FOR FREE DEMO DISK

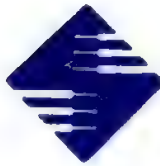
Find out how quickly and easily you can find exactly the computer products you need — call today for a FREE Computer Select demonstration disk. No obligation. No commitment. Tons of information.

1-800-827-7889 ext. 102



**The Fastest Way To Find
The Perfect Product**





SANTRON
1-800-938-7888

M-F: 7:00am to 6:00pm; Sat: 9:00am to 5:00pm (Pacific Time)



Magic-Color

Santron's 486 Magic-Color Notebook offers a fast and polychromatic LCD display matching VGA color standard. With its true-color tone, brilliancy, and too-good-to-be-true price, it may well be the time for you to upgrade your black-and-white view of notebooks and return back to the original, colorful world.



Magic-Color

Color Notebook

6 lbs; 11"x8.5"x2"
 8K Burst Cache
 4MB RAM
 1.44MB FD
 80MB 15ms HD
 Color VGA Display
 Resume/Suspend
 Battery; ac/dc Adaptor
 Numeric Keypad
 H-Res 3-B Mouse
 DOS 5.0/ Windows 3.1
 Deluxe Carrying Case
 1-y Warranty

486DX33 **\$2,995**

Ultimate

486 Notebook

6 lbs; 11"x8.5"x2"
 8K Burst Cache
 4MB RAM
 1.44MB FD
 125MB 15ms HD
 32 Gray Scales
 Resume/Suspend
 Battery; ac/dc Adaptor
 Numeric Keypad
 H-Res 3-B Mouse
 DOS 5.0/ Windows 3.1
 Deluxe Carrying Case
 1-y Warranty

486DX33 **\$2,095**
 486SX25 **\$1,795**



optional accessories:
 battery charger • battery
 pack • car dc adaptor •
 fax/modem • ethernet
 adaptor • docking station



A reliable yet powerful notebook can make your day, when you are on the go. Compiling massive yet important data often demands large amount of valuable time, which

WHAT IF WE CONTINUE a busy person like you can hardly spare. At
TO OFFER STURDY AND FAST Santron, we try very hard to compensate
NOTEBOOKS AT your loss on time, since it is the most
AFFORDABLE PRICES? patience for something that is meaningful.... Let us save your
 our most favorable, dependable 486DX-33 *Ultimate* notebook, this highest performance-price-ratio unit has
 surpassed its planned demand pattern. Besides
 widening our supply margin, we, at Santron can only maintain its low price to exhibit
 our appreciation....

Each month, week, and often each day, Santron's demanding engineers develop and evaluate state-of-the-art technologies and components, test their stabilities and compatibilities, engineer them into ready-to-use PC formats, and equip them with Santron's most

favorable service contract - 1 year on parts, 2 years on motherboard, 3 years on labor, and 1 year on-site service.

At Santron, we are enthused

about product advancements yet without sacrificing quality. We

believe in reflecting reasonable and affordable pricing to customers, because it is the way it should be. From VESA Local Bus, 486, to 386, Santron is committed to providing the best solutions and answering your computing needs for many years to come.

WHAT IF WE OFFER REASONABLE PRICES ON TOP OF ADVANCED QUALITY PRODUCTS?



ONE YEAR

Free On-Site Service
Through Nationwide
Warranty Corp.

1-2-3

Warranty:
1 Year on Parts,
2 Years on Mainboard,
3 Years on Labor.

30-DAY

Risk-Free Moneyback
Guarantee

LIFETIME

Unlimited Access
Toll-Free Support



VESA

Local Bus 486

256K 20ns Cache
4MB 70ns RAM
1.2/1.44 Teac FD
130MB 15ms HD
TiSeng ET-4000 SVGA
14" N-I SVGA .28mm
Focus 9000 Keyboard
H-Res 3-B Mouse
DOS 5.0/ Windows 3.1
1-y On-Site Service

486

64K 20ns Cache
4MB 70ns RAM
1.2/1.44 Teac FD
130MB 15ms HD
1MB SVGA Card
14" N-I SVGA .28mm
101-Eh Keyboard
H-Res 3-B Mouse
DOS 5.0/ Windows 3.1
1-y On-Site Service

386

64K 20ns Cache
4MB 70ns RAM
1.2/1.44 Teac FD
80MB 15ms HD
512KB SVGA Card
14" SVGA .39mm
101-Eh Keyboard
H-Res 3-B Mouse
DOS 5.0/ Windows 3.1
1-y On-Site Service

pc-GP-LCD

Gas Plasma or LCD
Display
64K 20ns Cache
4MB 70ns RAM
1.2/1.44 Teac FD
125MB 15ms HD
Carrying Case
H-Res 3-B Mouse
DOS 5.0/ Windows 3.1

dx33 \$1,795
dx50 \$1,995
dx50 \$1,895
dx66 \$2,295

dx33 \$1,545
dx50 \$1,745
dx50 \$1,645
dx66 \$1,995
sx25 \$1,275

dx33 \$1,075
sx33 \$ 975
sx25 \$ 945

486dx33 \$1,945
486dx50 \$2,145
486sx25 \$1,695
386dx33 \$1,595

Multimedia

\$ 545

Panasonic 680MB CD-ROM
Sound Blaster Pro
Multiple Media-Interface Support
Windows-Multimedia Extension 1.0
MS Bookshelf/Reference Library
Prosonus and Creative Sounds

Upgrades

ET4000 to S3 Graphic Accelerator \$ 125
14" 1024H-I to 15" 1280H-I \$ 145
From 80MB to 130MB HD \$ 85
From 130MB to 210MB HD \$ 175
From 210MB to 340MB HD \$ 395
32bit Local Bus SCSI Kit \$ 245

SANTRON
1-800-938-7888

M-F 7:00am to 6:00pm, Sat 9:00am to 5:00pm (Pacific Time)
Purchase Orders/Quotations Inquiries Fax to: 415-571-6079
Tech Support Tel: 1-800-275-7555, M-F 8-5, Sat 10-4

The Intel Inside logo is a trademark of Intel Corporation.
© 1992 Santron Computer, 1185 Chass Drive, Suite 1, Foster City, California, 94404

Circle 257 on Reader Service Card.

which is to say, it really is a feature rather than a bug. The whole point of setting WinWord to an exact line spacing is to let you control the spacing manually. And the only reason you would want to do that is if the program's automatic spacing doesn't provide the effect you want.

As a general rule, then, you shouldn't be using the Exactly setting unless the automatic adjustment isn't yielding acceptable results. This is a special case of the well-known rule: If it ain't broke, don't fix it.

If you do need to use the Exactly setting, note that by default you enter the setting in lines, but you can also enter it in centimeters, inches, picas, or points. Simply add the appropriate abbreviation following the number: cm, in, pi, or pt.
— M. David Stone

Spreadsheets

GRAPH-SHOW MACRO FOR 1-2-3

TIP Have you ever wanted to review all the graphs in your Lotus spreadsheet, one by one? The more graphs you have, the more tedious this effort becomes. I've created a set of macro routines, shown in Figure 2, that lets me cycle through all the graphs in the current worksheet, simply by pressing Alt-S to start the process, then Enter to switch from graph to graph. The macro, which I keep in a Macro Library Manager library file, creates a new macro on the current worksheet, then executes this new macro to display the current sheet's graphs.

The \S routine, which begins at B1 in Figure 2, goes to the bottom of the current worksheet and begins writing the new macro, called Seegraphs. In this new macro, it types in some commands, prints a table of graph names, and performs some simple edits on those names. The macro then branches to the routine named Finish to make an additional edit to the last graph name listed. Finally, the newly created macro is executed.

When recreating this macro, be sure to assign the range names \S, Edit, and Finish to the cells B1, B6, and B10, respectively.

You can run Seegraphs as often as you

SEEGRAF.WK1		
Complete Listing		
	A	B
1	\s	{end}{home}{d 3}
2		{end}{left}
3		/rncSeegraphs~
4		{{}windowsoff{{}}{}}paneloff{{}}/gnu~{d}
5		/gnt~q
6	Edit	{edit}{~}{~}{~}{d}
7		{if @cellpointer("type")="b"}{finish}{quit}
8		{branch edit}
9		
10	Finish	{goto}Seegraphs~
11		{end}{d}
12		{edit}{bs 2}q~
13		{Seegraphs}



Figure 2: A Lotus 1-2-3 macro that lets you view all the graphs in a worksheet.

want, using the Alt-F3 command to execute the macro. But if you add or change graphs and want to run \S again, you must delete the range name Seegraphs, since that range name gets created again each time \S is run.

Dan Rogers
Rochester Hills, Michigan

PC MAGAZINE: In addition to helping you review the graphs you've created in a Lotus 1-2-3 worksheet, this macro provides a way of creating simple graph-based presentations in 1-2-3. Just create your graphs, assign them a set of alphabetically ascending names following the order in which you want them displayed, and press Alt-S to start the show.

If you're new to macro-writing macros, some of the commands used in Mr. Rogers's macro may look a little odd at first. The {} and {} commands, for example, enter braces into a cell without causing 1-2-3 to treat the braces as part of a macro verb. Similarly, the {~} command types a tilde without causing 1-2-3 to behave as if you had just pressed the Enter key.

I would suggest two small changes to this macro. First, to eliminate the necessity of deleting the Seegraphs range when the \S macro is rerun, begin \S with commands to create and then delete the name Seegraphs. In other words, make the macro start like this:

```
\S 'rncSeegraphs~ ~/rndSeegraphs~
{end}{home}{d 3}
etc.
```

Note that you can't simply start with a command to delete Seegraphs, because

if that name doesn't yet exist, 1-2-3 will reject the /rnd command.

Second, as the \S macro now stands, the Seegraphs macro it creates uses tildes in a few places where it would be better form to use letters. For example, if the worksheet on which you execute \S has three graphs named LINE, BAR, and PIE, the Seegraphs macro created by \S will look like this:

```
{windowsoff}{paneloff}/gnu
BAR ~ ~ ~
LINE ~ ~ ~
PIE ~ q
```

After the {windowsoff} and {paneloff}, the /gnuBAR~ executes a /Graph Name Use command, supplies the name BAR, and executes a carriage return. 1-2-3 responds by displaying the BAR graph. When you press Enter after looking at the graph, 1-2-3 returns to the Graph menu, and macro execution continues with the next two tildes. These tildes select the Name and Use commands again, simply because those happen to be the default choices on the menu tree. There's no disaster in doing this, but the macro would be easier to read if you substituted the letters N and U for those tildes. To do that, change B6 from

```
{edit}{~}{~}{~}{d}
```

to

```
{edit}{~}nu{d}
```

Using the actual command letters instead of tildes also gives you some insurance against the possibility that a later version

Quantum Leap Performance

THUNDER SPEED WITH THE NEW GENERATION VITEK & S3 GRAPHICS ACCELERATOR!

486 EISA WinStation

- 64K Fast Cache SRAM & Expandable to 256K
- 4 MB RAM & Expandable to 128MB
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drives
- 170 MB 13ms IDE 64K Cache Drive
- 32-Bit EISA Hard Disk Controller (4X faster DTR)
- Ramond/Orchid S3 (49M WinMark) Graphics Accelerator
- 1 MB RAM (Up to 1280x1024 & up to 16.7M Colors)
- 14" Non-interlaced 28mm Super VGA Monitor (VESA Standard for 72Hz Flicker-Free)
 - 2 Serial, 1 Parallel & 1 Game Ports
 - Enhanced 101-key Keyboard
 - Hi-Resolution 400DPI Serial Mouse
- Free Microsoft DOS 5.0 & Windows 3.1

486/33 DX \$1945

486/50 DX2 \$2065

486/50 DX \$2195

486/66 DX2 \$2295

- 8 MB RAM & 250 MB 12ms Drive Add \$280
- 32-Bit VL-Bus Viper S3-805 Accelerator Add \$50

VESA Local Bus WinStation

- 64K Fast Cache SRAM & Expandable to 256K
- 4 MB RAM & Built-in 487 Math Coprocessor
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drives
- 170 MB 13ms IDE 64K Cache Drive
- 32-Bit VL-Bus Viper S3-805 Graphics Accelerator
- 1 MB RAM (Up to 1280x1024 & 16.7M True Colors) (Up to 50X faster than standard SVGA)
- 14" Non-interlaced 28mm Super VGA Monitor (VESA Standard for 72Hz Flicker-Free)
 - 2 Serial, 1 Parallel & 1 Game Ports
 - Enhanced 101-key Keyboard
 - Hi-Resolution 400DPI Serial Mouse
- Free Microsoft DOS 5.0 & Windows 3.1

486/33 DX \$1795

486/50 DX \$2075

486/66 DX2 \$2145

- 8 MB RAM & 250 MB 12ms Drive Add \$280
- 32-Bit VL-Bus Hard Disk Controller Add \$50

VESA Local Bus Tornado

- 64K Fast Cache SRAM & Expandable to 256K
- 8 MB RAM & Built-in 487 Math Coprocessor
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drives
- 32-Bit VL-Bus IDE Hard Disk Controller
- 250 MB Ultra Fast 12ms IDE 64K Cache Drive
- 32-Bit VL-Bus Viper S3-805 Graphics Accelerator
- 1 MB RAM (Up to 1280x1024 & 16.7M True Colors) (2.5 times faster than ATI Ultra Pro in CAD test)
- 15" Flat Screen 1280x1024 SVGA Color Monitor
 - AutoCAD Display List Driver
 - 2 Serial, 1 Parallel & 1 Game Ports
 - Enhanced 101-key Keyboard
 - Hi-Resolution 400DPI Serial Mouse
- Free Microsoft DOS 5.0 & Windows 3.1

486/33 DX \$2225

486/66 DX2 \$2575

- 17" Flat Screen 1280x1024 Monitor Add \$420

*The Intel Inside Logo is a trademark of Intel Corporation



VESA STANDARD LOCAL BUS NOW.

Once again "THE LIGHTNING COMTRADE PC" has the competition running for cover. In review after review, critic's applaud Comtrade shocking speed and extraordinary value. According to the latest PC Magazine, Comtrade's 486 "Has The Performance Issue Licked." So much so that PC Magazine ranked Comtrade's 486 EISA WinStation number 2 out of 63 systems in their 486 review "MOST BANG FOR THE BUCK" analysis (September 1992). "It's A Very Swift Graphics Machine," says Computer Shopper (May 1992). "That Deserves Serious Consideration from Anyone Who Wants to Juice up Windows." And now faster than ever, Comtrade's new generation VESA standard Local Bus Viper S3-805 is even 3 to 5 times faster than any of our previously reviewed systems.

Comtrade Kicks Gateway's Bus!

In Comparison With Gateway 2000's VESA Local Bus ATI Ultra Pro.

52M



VESA LB
Viper
S3-805



28M



VESA LB
ATI
Ultra Pro

Based on WinMarks 2.5 as of NOV 1992

*Million Pixels Per Second (486/66 DX2)

Standard SVGA has only 1.4M WinMarks
VL Bus TSING ET-4000 has only 4.8M WinMarks

Read the benchmarks and weep. Comtrade's latest VESA Standard Local Bus passes the others like their standing still. Not only does our VL-Bus Viper S3-805 beat ATI VL-Bus Ultra Pro hands down in overall Windows performance test, it is also up to 2.5 Times faster in the LandMark DOS text mode and CAD/CAM (WinTach) test. Combine this unprecedented performance with a solid reputation for quality and service, and a very competitive price - And it's no wonder Computer Shopper (November 1992) called the Comtrade 486 "A Splendid System Backed by First Rate Support."

CIRCLE 316 ON READER SERVICE CARD

- We Stand Behind Our Products
- Two Year Parts & Labor Warranty
- One Year On-Site Service
- 30-Day Money Back Guarantee

486 EISA Dream Machine

- The Ultimate EISA System with VL-Bus Accelerator
- 256K Ultra Fast Write Back Cache SRAM
- 4 MB RAM & Expandable to 128 MB
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drive
- 250 MB Ultra Fast 12ms IDE 64K Cache Drive
- 32-Bit EISA Hard Disk Controller (4X faster DTR)
- 32-Bit VL-Bus Viper S3-805 Graphics Accelerator
- 1 MB RAM (Up to 1280x1024 & 16.7M True Colors)
- 15" Flat Screen Non-interlaced 28mm SVGA Monitor (Up to 1280x1024 with Processor Control)
 - 2 Serial, 1 Parallel & 1 Game Ports
 - Enhanced 101-key Keyboard
 - Hi-Resolution 400DPI Serial Mouse
- Free Microsoft DOS 5.0 & Windows 3.1

486/33 DX \$2595

486/50 DX2 \$2525

486/50 DX \$2645

486/66 DX2 \$2745

- 17" Flat Screen 1280x1024 SVGA Monitor Add \$420

VESA Local Bus SVGA

- 64K Fast Cache SRAM & Expandable to 256K
- 4 MB RAM & Built-in 487 Math Coprocessor
- 1.2 MB 5.25" & 1.44 MB 3.5" Floppy Drives
- 170 MB 13ms IDE 64K Cache Drive
- 32-Bit VL-Bus Windows Accelerated Super VGA w/ 1 MB RAM (Up to 1280x1024 & up to 16.7M True Colors) (Up to 7X faster than standard SVGA)
- 14" Non-interlaced 28mm Super VGA Monitor (VESA Standard for 72Hz Flicker-Free)
 - 2 Serial, 1 Parallel & 1 Game Ports
 - Enhanced 101-key Keyboard
 - Hi-Resolution 400DPI Serial Mouse
- Free Microsoft DOS 5.0 & Windows 3.1

486/33 DX \$1695

486/50 DX \$1975

486/66 DX2 \$2045

- 8 MB RAM & 250 MB 12ms Drive Add \$280
- 32-Bit VL-Bus Hard Disk Controller Add \$50

1.800.969.2123

COMTRADE

"Where Quality is Everything"

International 818.961.6688

Fax 818.369.1479

Japan 0473.34.3700

Tech Support 800.899.4508

24-Hour BBS Service 818.961.6098

Hours: 7:00-7:00 Pacific Mon-Sat

15314 East Valley Boulevard

City of Industry, California 91746

EPS GIVES YOU VESA LOCAL BUS AND AN UNBEATABLE

In 1990, '91 and '92, people like yourself voted to honor the EPS 486 33 MHz with the Readers Choice Award and here's why. We've proven that EPS offers a quality computer at a great price and that's only the beginning.



EPS offers customers several crucial elements that others don't. Take for example our 15" digital monitor with its flat screen and non-glare



tube. It's available with all our systems. The digital monitor offers push button controls

which are more accurate than thumbwheel units. They give you horizontal and vertical sizing adjustment which eliminates pin-cushioning or barrel effects, plus allow huge blow-ups of on-screen images with entire-screen positioning.

We also offer 256K cache. There are companies who will tell you that anything over 64K is a waste. To them we say, "NOT." The larger

the cache the greater the hit ratio, which means your desired data will be provided without delay, thus causing higher performance. In addition, the larger the cache the more locations there are to store data. With 256K cache you have a 90% greater hit ratio.

OUR VESA LOCAL BUS IS HOT!

The industry is buzzin' with VESA local bus and EPS offers the hottest performance on the market. We guarantee you'll be blown away by its incredible speed. We're talking performance! Our first EPS local bus slot is accompanied by our 'warp speed', local bus card, allowing you to achieve **40 million plus winmarks** (when tested with our EPS

66MHz), 16 million colors, 1 MB of VRAM or 2 MB VRAM for 1280 x 1024 non-interlaced with 256 colors, making it ideal for Windows applications. In fact, it gives you the highest local bus graphics capabilities in the industry. That's something everybody's buzzin' about.

EPS ISA & EISA SYSTEMS

EPS 486 ISA & EISA Models Standard With:

- ▶ INTEL 486 Processor, 256K Cache On Board (Your Option: 486-SX 25MHz, 33MHz, DX2-50MHz, DX2-66MHz DX2 50MHz EISA & DX2 66MHz EISA)
- ▶ 4 MB High Speed RAM
- ▶ Both TEAC 1.2 MB & 1.44 MB Floppy Disk Drives
- ▶ Maxtor 130 MB IDE HD (15ms)
- ▶ Orchid Fahrenheit 1280 VA Voice Annotation 1 MB SVGA Card. With Exclusive Voice Notes Software
- ▶ EPS 14" 1024 x 768 Non-Interlaced SVGA Monitor .28 Dot Pitch
- ▶ 101 Enhanced Keyboard
- ▶ Baby Desktop Case w/o Drive Bays
- ▶ MS WINDOWS 3.1
- ▶ MS DOS 5.0
- ▶ 3-Button 1600 DPI Mouse
- ▶ System User Manual
- ▶ 60-Day Money-Back Guarantee
- ▶ 3-Year Superior Warranty
- ▶ 1-Year On-Site Service. Extension Available
- ▶ Customizing Available

POPULAR OPTIONS

- An Additional 4 MB Of Ram **\$139.00**
- 213 MB Maxtor Hard Drive **95.00**
- 15" Digital EPS Monitor With Push Button Ease **125.00**
- Vertical Case w/250 Watt P/S & 2 Cooling Fans **75.00**
- 250 MB Tape Back Up w/Tape **195.00**
- EPS 14.4 Fax/Modem **195.00**

Many, Many More Options Are Available. Call Your EPS Sales Consultant Now:

486-SX 25MHz Standard 0 Cache w/ overdrive CPU Socket

Our second VESA local bus slot offers our high-speed local bus IDE controller, which gives you

Now Available: the Orchid 1280 VA, Voice Annotation Card - This Windows accelerator has a HyperDriver that delivers the fastest Windows available. If the Orchid Voice Annotation card is too much for you, we have our 16.7 million color 1 MB 24 bit SVGA card (w/accelerated Windows drivers)

Note price below*

486-SX 25MHZ
\$1545
*\$1475

486-DX2 66MHZ
\$2095
*\$2025

486-33MHZ
\$1845
*\$1775

486-DX2 50MHZ EISA
\$2245
*\$2175

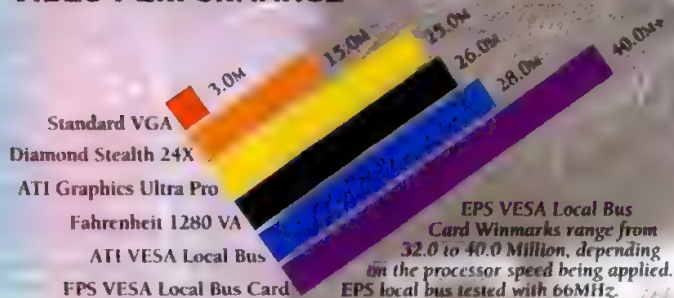
486-DX2 50MHZ
\$1945
*\$1875

486-DX2 66MHZ EISA
\$2395
*\$2325

WITH POWER, PERFORMANCE 3-YEAR WARRANTY

a 70% faster throughput over conventional ISA IDE. Like we said, it's hot! For those of you that

VIDEO PERFORMANCE



demand the ultimate in caching controllers, we offer the option of 512K to 16 MB of on board disk cache -

giving you a dynamic 10 MB of data throughput!

The folks at PC World were so impressed with our 486 33MHz that they gave us their Best Buy Award.



If that's not enough to sell you, in December of '89 we were the first to offer a 60-day money-back guarantee, and now we're setting the pace by being the first to offer our superior 3-year warranty. It's no wonder intelligent people like yourself have made the choice to buy EPS.

**486 33 MHz
SYSTEM**

Call your sales consultant today.



VESA LOCAL BUS SYSTEMS

486-33MHz \$1995

486-50MHz DX2 \$2145

486-66MHz DX2 \$2295

STANDARD CONFIGURATION

- ▶ INTEL 486 Processor, 256K Cache On Board (Your Option: 33MHz, DX2-50MHz & DX2-66MHz)
- ▶ 4 MB High Speed RAM
- ▶ Both TEAC 1.2 MB & 1.44 MB Floppy Disk Drives
- ▶ Maxtor 130 MB IDE Hard Drive (15ms)
- ▶ Local Bus Hi-Speed IDE Controller (70% Faster Than Standard ISA IDE)
- ▶ EPS 'Warp Speed' VESA Local Bus Card 1 MB VRAM (Optional 2 MB VRAM)
- ▶ EPS 14" 1024 x 768 Non-Interlaced SVGA Monitor .28 Dot Pitch
- ▶ 101 Enhanced Keyboard
- ▶ Baby Desktop Case w/6 Drive Bays
- ▶ MS WINDOWS 3.1
- ▶ MS DOS 5.0
- ▶ 3-Button 1600 DPI Mouse
- ▶ System User Manual
- ▶ 60-Day Money-Back Guarantee
- ▶ 3-Year Superior Warranty
- ▶ 1-Year On-Site Service, Extension Available
- ▶ Customizing Available

EPS Technologies

"a tradition of value and performance"

1-800-447-0921
ORDER TODAY TOLL FREE

FAX Orders 1-605-966-5482

Direct Line 1-605-966-5586

Tech Hot Line 1-800-526-4258

GSA Contracts #GSOOK91AGS5035-OPT1

EPS Technologies, Inc. 10069 Dakota Avenue

P.O. Box 278 Jefferson, SD 57038

Hours: 7am-7pm M-F, 9am-3pm Sat CST

All brands and product names mentioned are trademarks or registered trademarks of their respective holders. Prices are subject to change without notice. INTEL is a trademark of INTEL Corporation

CIRCLE 197 ON READER SERVICE CARD

BEFORE YOU BUY FROM THE



**486 DX-33 MHz
Color Notebook
8K, 4MB RAM
120MB HARD DRIVE.**

\$3,375

**INCLUDES: BUILT-IN TRACK BALL,
BLACK LEATHER CARRYING CASE,
EXTERNAL NUMERIC KEYPAD,
FIVE PROGRAMS INSTALLED:**

**MS DOS 5.0, MS Windows 3.1,
Direct Access Menu Program, FastBack
Back-up Program, Untouchable
Virus Protection Program.**



SPECIFICATIONS: Intel 486 DX-33 MHz Processor, 11.0" wide x 8.6" long x 2" high, approximately 7.0 lbs. w/battery, operation time up to 3.5 hours, 83-key keyboard, 3 5" 1.44MB floppy drive, 256 colors, passive 640x480 9" Diagonal Resolution, Ni-Cad battery, 2 serial ports/1 parallel printer port, 1 external keyboard port for 101/102 Keys, 1 external numeric keypad port (2 wires), AT-Bus I/O (100-pin) for docking station. Programmable power down feature and screen.

Unlike the other guys, we don't spend lavishly on promotion. And you don't end up having to pay for it.

Instead, we lavish our customers with quality, value and service. Note this notebook - we can afford to give you color and 486 DX power at a black & white 486

notebook price. We even throw in a good quality carrying case, an external Keypad and a comprehensive software package.

Doesn't matter whether you buy a notebook or a powerful customized office PC network, you always get more for less, from U.S.

YOU GET MORE FOR LESS FROM

All prices subject to change without notice. Prices do not include shipping or tax. * Call or write for guarantee details.

FARMER OR THE DELL, CALL U.S.

SEE
NEXT
PAGE
FOR
SPECS



486 DX-33 MHz Desktop 2MB RAM, 85MB HARD DRIVE.

W/Mini-Desktop Case or Minitower Case (shown)
MS DOS 5.0, MS Windows 3.1, Direct Access
Menu Program, Fastback Plus, Untouchable Virus
Protection, All Installed.



SEE
NEXT
PAGE
FOR
SPECS.

486 DX-33 MHz Notebook 4MB RAM, 120MB HARD DRIVE.

INCLUDES BLACK LEATHER CARRYING
CASE, EXTERNAL NUMERIC KEYPAD,
FIVE PROGRAMS INSTALLED:

MS DOS 5.0, MS Windows 3.1, Direct Access
Menu Program, FastBack Back-up Program,
Untouchable Virus Protection Program.

UPGRADES YOU CAN AFFORD.

When you buy from U.S. Systems, getting a great price on a computer system is only the beginning. Unlike some companies, we don't sock it to you on the extras

Let's say you want to double the notebook RAM to 8MB. You can do that for only \$200. And you can double the hard drive to 240 MB for only \$300.

Want to turn your notebook into a full-fledged office PC? You can do it with our two-slot Docking Station for just \$215.

And check out our prices on additional software. They're pleasantly surprising rather than unpleasantly shocking.

BARE-BONES PRICES SERVED UP WITH GRAVY.

- ✓ 30-Day money back guarantee*
- ✓ Lifetime toll-free technical support
- ✓ One year on-site service for all desktop systems
- ✓ Guaranteed 4-24 hour service response
- ✓ One year full manufacturers warranty on all notebook and desktop systems
- ✓ All systems with five programs installed
- ✓ On or off-site program training (most major cities)
- ✓ Most credit cards accepted, no surcharge
- ✓ **Guaranteed shipping within 72 hours**
(overnight delivery available)

CALL OR WRITE FOR INFORMATION AND
PRICES ON OUR FULL LINE OF COMPUTER
SYSTEMS. MON-FRI./8AM TO 6PM PST. 15041
BAKE PARKWAY, UNIT L, IRVINE, CA 92718.
PHONE 714-580-1700, FAX 714-580-1701.



All brand and product names are registered trademarks of their respective companies. The Intel Inside Logo is a registered trademark of The Intel Corporation.

**THERE'S MORE TO U.S.
THAN THIS, TURN THE PAGE.**

U.S. SYSTEMS 1-800-872-7239

& Technologies, Inc.

For sales and Tech Support Dept. code #124

GET MORE FOR LESS FROM U.S.

NOTEBOOKS

HARD DRIVES	85MB	120MB	170MB	200MB	240MB
486 SX-25	\$1975	\$2075	\$2175	\$2275	\$2375
486 DX-33	\$2475	\$2575	\$2675	\$2775	\$2875
486 DX2-50	\$2775	\$2875	\$2975	\$3075	\$3175
COLOR 486 DX-33	\$3275	\$3375	\$3475	\$3575	\$3675
COLOR 486 DX2-50	\$3475	\$3575	\$3675	\$3775	\$3875

U.S. SYSTEMS + TECHNOLOGIES NOTEBOOK PACKAGE: All processors manufactured by Intel Corporation. Software: MSDOS 5.0, MS Windows 3.1, Easy Access Menu Program, Fastback Plus Program and Untouchable Virus Protection Program, all installed. Trackball: Included in Color Notebook only. Case: Black Leather Carrying Case Included. Keypad: External Numeric Keypad Included. Video Display: Supertwist LCD with CCFT backlit. VGA/EGA/CGA/MGA/Hercules Compatible Mode. Brightness and Contrast Control. Monochrome Display: 640x480 Pixels Resolution with 32 Gray Scale Levels. Color Display 256 Colors. Passive Matrix 640x480 9" Diagonal Resolution, Programmable Screen Saver. Disk Drives: One 3.5" 1.44MB Micro Floppy Disk Drive. Built-in 3.5" Hard Disk Drive. Access time for 120MB is 15ms. AT-Bus interface. Programmable power down feature. Interfaces: Two Serial Ports. One Parallel Port for Printer. 15-Pin External Video Port. External Numeric Keypad Port (2 wires). External Keyboard Port for 101/102 Keys. AT-Bus I/O (100 Pins) for Docking Station. Keyboard: Enhanced Multifunctional Keyboard. Special Fn Key for Extend Function, Multinational Key Legends. Integrated Numeric Keypad. Power Supply: Full Range Autoswitching AC Adaptor. Chargeable and Rechargeable Ni-Cad Battery Packs. Charging time only hours. Battery life lasts 3 hours. Dimensions and Weight: 280mm (W) x 220mm (D) x 54mm (H); 11" (W) x 8.6" (D) x 2" (H); 5.7/lbs (w/out battery); 7.1/lbs (w/ battery).

DESKTOPS

386 SX-25MHz WORKSTATION \$775

Slimline Desktop, Mini Tower or Mini Desktop Case, 230 Watt Power Supply, Intel 386 SX-25MHz Processor, 1MB RAM upgradeable to 8MB RAM, High Performance UMC Chipset, 12MB 5.25" Floppy Drive, upgradeable to include 1.44MB 3.5" Floppy Drive, 14" Mono Monitor and Mono Card with LPT Port, upgradeable to 14" Color VGA Monitor and VGA Card, IDE Hard and Floppy Controller, 101-Enhanced Keyboard upgradeable to Calculator Keyboard, Hard Drive available up to 130MB 64K Cache.

386 SX-33MHz \$975

Intel 386SX-33MHz Processor, 1MB RAM upgradeable to 16MB RAM, High Performance UMC Chipset, 40MB 16ms IDE Hard Drive with 32K Segmented Cache upgradeable to 340MB, SCSI 256K Cache with Controller, 1.2MB 5.25" Floppy Drive, upgradeable to include 1.44MB 3.5" Floppy Drive, VGA Card with Video RAM 256K, 14" VGA Color Monitor, upgradeable to 17" Non Interlaced SVGA Color Monitor, IDE Hard and Floppy Controller, 101-Enhanced Keyboard, upgradeable to Calculator Keyboard.

486 SX-25MHz \$1375

Intel 486 SX-25MHz Processor, 2MB RAM upgradeable to 32MB, High Performance CONTAQ Chipset, 85MB 14ms IDE Hard Drive with 64K Segmented Cache upgradeable to 340MB, SCSI 256K Cache, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit VGA, with a 14" color VGA Monitor, 800x600 Resolution upgradeable to 17" Non Interlaced, 101-Enhanced Keyboard upgradeable to Calculator Keyboard.

486 DX-33MHz \$1975

Intel 486DX-33MHz Processor, 2MB RAM upgradeable to 32MB RAM, High Performance CONTAQ Chipset, 128K Memory Cache, 85MB 14ms IDE Hard Drive with 64K Segmented Cache, upgradeable to 340MB, SCSI 256K Cache, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

486 DX2-50MHz \$2275

Intel 486 DX2-50MHz Processor, 4MB RAM upgradeable to 32MB RAM, High Performance CONTAQ Chipset, 128K Memory Cache, 130MB 14ms IDE Hard Drive with 64K Segmented Cache upgradeable to 340MB, SCSI 512K Cache with 16-bit SCSI Controller, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution, upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

486 DX-50MHz \$2475

Intel 486 DX-50MHz Processor, 4MB RAM upgradeable to 32MB RAM, High Performance CONTAQ Chipset, 128K Memory Cache, 130MB 14ms IDE Hard Drive with 64K Segmented Cache upgradeable to 340MB, SCSI 512K Cache with 16-bit SCSI Controller, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution, upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

486 DX-50MHz EISA \$3475

Intel 486DX-50MHz EISA Processor, 8MB RAM upgradeable to 64MB RAM, High Performance CONTAQ Chipset, 256K Memory Cache, 340MB 14ms SCSI Hard Drive with 512K Multi-Segmented Cache, upgradeable to 1.2 Gigabyte SCSI, 32-bit EISA SCSI Controller, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

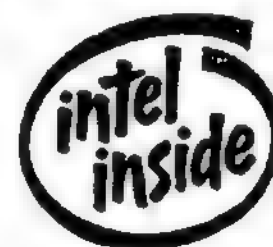
486 DX2-66MHz \$2675

Intel 486DX2-66MHz Processor, 4MB RAM upgradeable to 32MB RAM, High Performance CONTAQ Chipset, 128K Memory Cache, 210MB 14ms IDE Hard Drive with 64K Segmented Cache, upgradeable to 1.2 Gigabyte with 32-bit SCSI Controller, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

486 DX2-66MHz EISA \$3275

Intel 486DX2-66MHz EISA Processor, 4MB RAM upgradeable to 32MB RAM, High Performance CONTAQ Chipset, 256K Memory Cache, 200MB 14ms SCSI Hard Drive with 128K Segmented Cache, upgradeable to 1.2 Gigabyte with 32-bit EISA SCSI Controller, 1.2MB 5.25" Floppy Drive, 1.44MB 3.5" Floppy Drive, 16-bit SVGA, 1MB with a 14" Color Super VGA Monitor Non Interlaced, 0.28mm Dot Pitch, 1024x768 Resolution upgradeable to 17" Non Interlaced, 129-Key, Calculator and Programmable Keyboard.

ALL DESKTOP SYSTEMS COME STANDARD WITH: Mini Tower or Mini Desktop Case, 230 Watt Power Supply upgradeable to Deluxe Tower Case, 300 Watt Power Supply, 6-16 bit ISA Expansion Slots, 2-8 ISA Expansion Slots, AMI or AWARD BIOS, 2 Serial Ports, 1 Parallel & 1 Game Port, MS-Compatible 3-Button Mouse (not included with Workstation), Easy Access Menu, MS DOS 5.0, MS Windows 3.1, Fastback Plus, Untouchable Virus Protection, Clock/Calendar with Battery Backup. All installed.



All brand and product names are registered trademarks of their respective companies. The Intel Inside Logo is a registered trademark of The Intel Corporation.

U.S. SYSTEMS & Technologies, Inc. 1-800-872-7239

For sales and Tech Support Dept. code #12

CIRCLE 020 ON READER SERVICE CARD

Q-Tech. The best PC values ANYWHERE!



Q-TECH 486SX-25 INCLUDES:

\$1399 PLUS SHPG

- Intel 80486SX 25 MHz microprocessor
- 8K internal RAM cache
- 4 MB of 70ns RAM, 80 MB IDE hard drive
- Two serial ports and 1 parallel port
- Free MS-DOS 5.0, Windows 3.1, a mouse, and one year on-site service
- High-density 5¼" and 3½" floppy drives
- Two 8-bit and six 16-bit expansion slots
- Desktop chassis with three 5¼" and two 3½" drive bays
- .28 mm dot pitch NI SVGA color monitor and 1 MB video card
- Quattro® Pro for DOS or Windows included
- Quill's exclusive software bonus package for just \$99 more. Choose from 12 popular titles from Computer Associates or Spinnaker...a \$710 value!

Q-TECH 486DX-33 INCLUDES:

\$1799 PLUS SHPG

- Intel 80486DX 33 MHz microprocessor
- 8K internal, 128K external RAM cache
- 4 MB of 70ns RAM, 80 MB IDE hard drive
- Two serial ports and 1 parallel port
- Free MS-DOS 5.0, Windows 3.1, a mouse, and one year on-site service
- High-density 5¼" and 3½" floppy drives
- Two 8-bit and six 16-bit expansion slots-tower chassis optional
- Desktop chassis with three 5¼" and two 3½" drive bays
- .28 mm dot pitch NI SVGA color monitor and 1 MB video card
- Quattro® Pro for DOS or Windows included
- Quill's exclusive software bonus package for just \$99 more. Choose from 12 popular titles from Computer Associates or Spinnaker...a \$710 value!



Q-TECH 486DX-50 INCLUDES:

\$2199 PLUS SHPG

- Intel 80486DX 50 MHz microprocessor
- 256K external RAM cache
- 4 MB of 70ns RAM, 80 MB IDE hard drive
- Two serial ports and 1 parallel port
- Free MS-DOS 5.0, Windows 3.1, a mouse, and one year on-site service
- High-density 5¼" and 3½" floppy drives
- Two 8-bit and six 16-bit expansion slots-tower chassis optional
- Desktop chassis with three 5¼" and two 3½" drive bays
- .28 mm dot pitch NI SVGA color monitor and 1 MB VGA video card
- Quattro® Pro for DOS or Windows included
- Quill's exclusive software bonus package for just \$99 more. Choose from 12 popular titles from Computer Associates or Spinnaker...a \$710 value!

Q-TECH 486DX2-66 INCLUDES:

\$2499 PLUS SHPG

- Intel 80486DX2 66 MHz microprocessor
- 8K internal, 256K external RAM cache
- 4 MB of 70ns RAM, 80 MB IDE hard drive
- Two serial ports and 1 parallel port
- Free MS-DOS 5.0, Windows 3.1, a mouse, and one year on-site service
- High-density 5¼" and 3½" floppy drives
- Two 8-bit and six 16-bit expansion slots-tower chassis optional
- Desktop chassis with three 5¼" and two 3½" drive bays
- .28 mm dot pitch NI SVGA color monitor and 1 MB VGA video card
- Quattro® Pro for DOS or Windows included
- Quill's exclusive software bonus package for just \$99 more. Choose from 12 popular titles from Computer Associates or Spinnaker...a \$710 value!



Please refer to ad code #424 when you call.

- Everyday Low Prices on every system
- All configurations shown shipped from stock within 24 hours
- Don't see what you need?. Call us - most customized configurations shipped within 48 hours!
- From a company whose quality office supplies you've known for decades
- Flexible payment options
- Your satisfaction completely guaranteed. Call for details - and free catalog!

708-634-6650



Quill Corporation
100 Schelter Road
Lincolnshire, IL 60069-3621

of 1-2-3 will rearrange the menu tree. (You can download SEEGRF.WK1 from the Utilities/Tips Forum on PC Mag-Net.)—*Craig Stinson*

@IF AND LABELS IN QUATTRO PRO

❓ I use spreadsheets to keep track of grades in my college classes. Along the way, I compare the performances of groups of students according to their major, credits earned, and gender. Two years ago, I created a spreadsheet template that is modified each semester based on the grading requirements of each class.

Keeping track of gender results was fairly easy before I upgraded to Quattro Pro 4.0. For each student, one cell contained a letter/label—either F or M. Another column contained a formula to track the numbers of males and females. For example, cell G1 would contain the expression `@IF(C1="M",1,"")`. Of course, column G would be titled MALES. The relevant formula for females, using "F", was placed in the column for FEMALES—for example, column H. Based on the entry in the appropriate column, a grade was noted. The column for MALES was summed, as was the column for FEMALES, with each sum being divided by the results of a `@SUM` formula at the base of either column G or H, as appropriate.

The spreadsheet template wasn't "tight" in all areas. For example, the number of students actually enrolled in a class might be as much as ten fewer than the number of rows reserved in the template. Even so, the `@IF` formula, along with the associated `@SUM` formula, was not adversely affected by the existence of an empty or missing value in a row.

In Quattro Pro 4.0, however, it appears that an `@IF` formula reference to an empty cell returns the "true" value. Thus, if C1 is empty, the formula `@IF(C1="M",1,"")` returns 1. As far as I can find, Quattro Pro's documentation does not alert users to the problems this upgrade can cause.

My solution is the formula

```
@IF(@ISERR(@EXACT(C1,"M")),*,@IF
(@EXACT(C1,"M"),1,""))
```

which is a bit longer than my original formula. Can you suggest a simpler alternative?

*George S. Cole
Hummelstown, Pennsylvania*

► **PC MAGAZINE:** Yes. The simplest and safest approach is to use the `@DCOUNT` function. Assuming your Gender column is a range named Gender, and that the first entry in this column is the label Gender, here's how you could do it:

Copy the label Gender to some other part of the worksheet that's not currently being used. Directly below this label, enter the value that you want to count. If you want to total the number of Ms, for example, put the letter M directly below the label Gender. Assign the name Criterion to this range. Now write the following formula:

```
@DCOUNT(Gender,0,Criterion)
```

This will return the number of entries in the column named Gender whose values are either m or M.

I'm not sure which version of Quattro Pro you were using previously, but both Version 3.0 and Version 4.0 exhibit the behavior described in your letter. They do so because they regard all label cells as having the value 0. An `@IF` test that compares a blank cell with the text string "M" returns true because both a blank and a label are considered to be 0. Quattro Pro behaves this way because 1-2-3 does. Why 1-2-3 does is anybody's guess.

The newly shipped Quattro Pro for Windows, however, breaks with the Lotus tradition on this as well as many other matters. In Quattro Pro for Windows, the formula `@IF(C1="m",1,0)` returns 0, not 1, if C1 is blank. This is good news—unless you happen to be importing a Quattro Pro/DOS worksheet that for some reason depended on the equivalence of blanks, labels, and zeros.—*Craig Stinson*

Databases

THE HARLESS COLOR SETS

► **PC MAGAZINE:** One of FoxPro 2.0's most cryptic features is its system for managing colors. If you've been trying to work with this system, the Harless Color

Sets is a product worth your attention.

Part of the blame for the difficulty of the FoxPro color system is the color picker dialog, which is cumbersome to use and difficult to understand. The rest of the blame lies in the system itself, which combines 240 color pairs into something called a color set. Managing that many color pairs and understanding how they fit into the FoxPro user interface is just not simple.

The idea is that you set up 24 color schemes (groups of 10 color pairs), *once*. Then you don't have to include color clauses all over the place in your code. Just let FoxPro do the coloring automatically, based on the color schemes you set up and the program context.

But in order to set up the schemes correctly, you have to understand how the color pairs in the schemes map to FoxPro screen objects. And to do this conveniently, you need something other than the FoxPro color picker dialog to let you experiment and choose colors.

The Harless Color Sets is both an easier and more capable color picker and a set of 50 new FoxPro color sets. Since color sets are largely a subjective matter, I won't say too much about the ones included except that they are very well designed (I happen to favor White Fox). The important thing is that the included Prism program makes it easy to take a color set and modify it to suit your own particular tastes.

Prism offers a number of different capabilities. For example, it gives you several different methods for modifying and viewing color sets, including a spreadsheet view that lets you see all 240 color pairs at once. It also does a great job of letting you see which FoxPro objects are affected by your changes, so that refining your color sets is easier. And it includes a facility for managing a library of color sets, either in FoxPro resource file format or in a database file. This makes loading and saving color sets easy. And there's a special mode that lets you preview the color sets in any resource file.

You can also audit color sets, which means Prism will examine your choices and tell you where you might want to reconsider (for example, if you've chosen colors that will cause some FoxPro objects to become invisible). This can be a great aid, as it helps point out the blind

TEST DRIVE THE NEW GRiD CONVERTIBLE.™

**It's a pen computer,
with the top down**

- Uses pen for data input
- Stores handwriting as script or text



- Rugged magnesium case
- Includes MS DOS 5.0 and Windows™ for Pen



WITH THE TOP DOWN.

**It's a notebook
computer, with
the top up**

- Pen replaces the mouse
- Intel386 SL microprocessor
- 9.5-inch screen
- Full-sized keyboard
- Runs traditional keyboard-based MS-DOS programs
- 125 megabyte hard drive
- Math coprocessor



- Includes MS DOS 5.0 and Windows™ for Pen
- PCMCIA Version 2 slot for network and wireless connectivity
- 2MB RAM with up to 8MB RAM available. **Act now and receive \$100 off the 2400 Baud Modem option.** Call GRiD On-Line Express at 1-800-934-GRiD, and test drive the new GRiD Convertible, today!



WITH THE TOP UP.

1-800-934-GRiD



GRiD is a registered trademark of GRiD Systems Corporation. GRiD Convertible, and GRiD On-Line Express are trademarks GRiD Systems Corporation. MS-DOS and Windows are trademarks of Microsoft Corporation. All other trademark and trade names are held by their respective owners and should be treated as such.

CIRCLE 014 ON READER SERVICE CARD

USA **FLEX** For Solutions That Are More Than Just Systems!

FLEX SYSTEMS... Designed to meet the most demanding workload and built from the highest quality components from companies like Mag Innovision, Seagate, Sony, ATI and Lexmark™, the Flex 486 Systems have earned a well-deserved reputation for remarkable price and performance.



FLEX 486SX 25MHz

- Intel486™ SX 25MHz Microprocessor
- 105 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- Super VGA Card with 1MB Memory for 1024 x 768
- 1.2 MB & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 & Mouse!

\$1349 Lease from \$60/Month*
FLEX 486SX 25MHz with 210MB hard drive \$1499

FLEX 486DX 33MHz

- Intel486™ DX 33MHz Microprocessor
- 64K Ultra-fast "Writeback" Cache
- 105 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- Super VGA Card with 1MB Memory for 1024 x 768
- 1.2 MB & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 & Mouse!

\$1649 Lease from \$62/Month*
FLEX 486DX 33MHz with 210MB hard drive \$1799

FLEX 486DX2 50MHz

- Intel486™ DX2 50MHz Microprocessor
- 64K Ultra-fast "Writeback" Cache
- 210 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- Super VGA Card with 1MB Memory for 1024 x 768
- 1.2 MB & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 & Mouse!

\$1949 Lease from \$73/Month*
FLEX 486DX2 50MHz with 340MB hard drive \$2149

FLEX 486DX2 66MHz

- Intel486™ DX2 66MHz Microprocessor
- 64K Ultra-fast "Writeback" Cache Memory
- 210 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- Super VGA Card with 1MB Memory for 1024 x 768
- 1.2 MB & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 & Mouse!

\$2199 Lease from \$82/Month*
FLEX 486DX2 66MHz with 340MB hard drive \$2399

ALL FLEX 486 SYSTEMS INCLUDE...

- Microsoft DOS 5.0
- Microsoft Windows 3.1
- One Year Parts and Labor Warranty
- 24 Hour Toll-Free Technical Support, 7 DAYS A WEEK!
- Over-Night Parts Replacement via Federal Express
- On-Site Service Should an Unusual Problem Occur
- 30 Day "NO RISK" Money Back Guarantee



ORDER YOUR FLEX SYSTEM READY TO GO!



Purchase any software package listed below...and we will install it on your FLEX System at no additional charge!

PFS: Window Works	\$89
Microsoft Works for Windows	\$129
WordPerfect for Windows	\$259
Quattro Pro for Windows	\$299
Microsoft Word for Windows	\$299
Lotus Freelance Graphics	\$299
Microsoft Excel	\$299
Lotus 1-2-3 for Windows	\$339
dBASE IV	\$449

*You buy the software and we will download it on to your NEW Flex system for FREE! Free downloading available only at the time of purchase of a Flex system. Downloaded and opened software is not refundable.

NEW! USA FLEX's VESA Local Bus Systems! Blazing Speed At An Affordable Price!

What Is FLEX VESA Local Bus?

Imagine cruising down the highway, when all of a sudden a sea of red brake lights appears before your eyes. You look ahead and spot the "MEN WORKING" and other construction signs. The bottleneck begins. Six lanes of traffic merging into one...every drivers nightmare.

These same frustrating "traffic jams" occur in PC's incorporating standard ISA or EISA bus design. With the increased demand for higher graphics and more colors, bottlenecks in video performance are most noticeable. In these systems, components such as the graphics controller, move data through the expansion bus-a 16-Bit wide path operating at 8MHz. The FLEX VESA Local Bus systems eliminate the bottlenecks by creating a 32-Bit wide path running at the systems clock speed. In the case of our FLEX VL486DX2 66MHz system, for instance, the bus throughput performance is improved almost 400% versus a comparable EISA system.

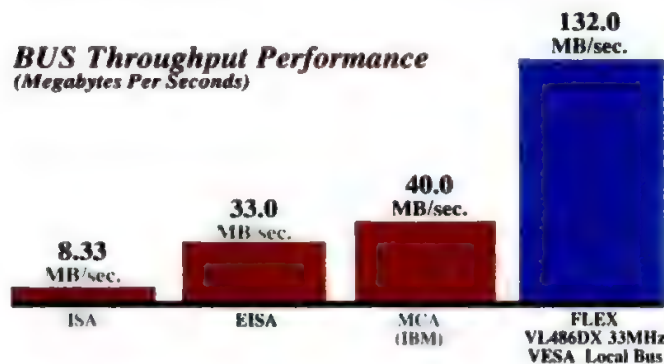
Why VESA Local Bus?

VESA - the Video Electronics Standards Association - is a group of manufacturers who have established the standard specifications for local bus design. What this means to you quite simply is that your FLEX VESA Local Bus System will be compatible with any device conforming to VESA standards and currently limited by bus performance-including video, multimedia, LAN adapters, datacompression and hard disk controllers.

Bus Throughput Performance

The Flex VESA Local Bus systems create a direct link between the graphics controller, the system CPU and the monitor. Therefore, the data is transferred at CPU clock speed rather than at the speed of the expansion bus. In the Flex VL486 33MHz VESA LB system, bus throughput performance is increased to 132.0MB/sec compared to 33.0MB/sec on a standard EISA system. See chart at below for comparisons.

BUS Throughput Performance (Megabytes Per Seconds)

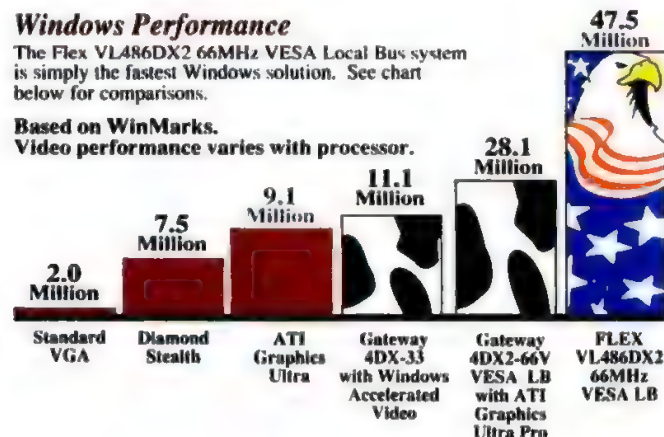


Windows Performance

The Flex VL486DX2 66MHz VESA Local Bus system is simply the fastest Windows solution. See chart below for comparisons.

Based on WinMarks.

Video performance varies with processor.



FLEX VL486SX 25MHz VESA Local BUS

- Intel486™ SX 25MHz Microprocessor
- 64K Ultra-fast Writeback Cache
- 105 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- VESA Local Bus Card with 1MB - 16.7 million colors
- 1.2 & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 and Mouse!

\$1549 Lease from \$58/Month*

FLEX VL486SX 25MHz with 210MB hard drive \$1749

FLEX VL486DX2 50MHz VESA Local BUS

- Intel486™ DX2 50MHz Microprocessor
- 64K Ultra-fast Writeback Cache
- 210 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- VESA Local Bus Card with 1MB - 16.7 million colors
- 1.2 & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 and Mouse!

\$2099 Lease from \$78/Month*

FLEX 486DX2 50MHz with 340MB hard drive \$2299

FLEX VL486DX 33MHz VESA Local BUS

- Intel486™ DX 33MHz Microprocessor
- 64K Ultra-fast Writeback Cache
- 105 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- VESA Local Bus Card with 1MB - 16.7 million colors
- 1.2 & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 and Mouse!

\$1799 Lease from \$67/Month*

FLEX VL486DX 33MHz with 210MB hard drive \$1949

FLEX VL486DX2 66MHz VESA Local BUS

- Intel486™ DX2 66MHz Microprocessor
- 64K Ultra-fast "Writeback" Cache
- 210 MB < 16ms Hard Disk Drive
- 4 MB RAM expandable to 32 MB
- Super VGA 1024 X 768 FLEXVISION 14" .28 mm Non-Interlaced Monitor
- VESA Local Bus Card with 1MB - 16.7 million colors
- 1.2 & 1.44 MB Floppy Drives
- 101 Key Keyboard
- 2 Serial and 1 Parallel Port
- Highest Quality Premium Cabinet Plus... Dos 5.0, Windows 3.1 and Mouse!

\$2299 Lease from \$87/Month*

FLEX 486DX2 66MHz with 340MB hard drive \$2499



USA FLEX

TO ORDER: **1-800-876-5609**

USA FLEX FAX # (708) 351-7204

Government & Education Sales 1-800-955-1485

Government & Education Fax (708) 351-9871

Habla Espanol 1-800-723-5500

Code # PM01B3



All products or services are identified by the trademarks or service marks of their respective companies. Specific software documentation may differ from that illustrated. All prices and specifications are subject to change without notice. Shipping and handling charges additional. 30 day money back guarantee applies to Flex systems only. Downloaded and opened software is not refundable. * Monthly payment based on 36 month open end lease. The Intel Logo is a registered trademark of Intel Corporation. Refer to code number when placing an order.

**3 YEAR LIMITED
WARRANTY ON
COMPAQ ProLinea,
Contura and
LTE Lite/25C
Models!**

HERE'S SOMETHIN NEW YEAR COMPAQ PRODUCTS

**COMPAQ ProLinea 3/25s...Reliability, Quality,
Performance...And A Great Price!**

COMPAQ ProLinea 3/25s

- Intel®386™ SX 25MHz Microprocessor
- 84MB Hard Drive
- 2MB RAM Expandable to 16MB
- 1024 x 768 Non-Interlaced Video Controller with 1MB Video Memory
- 3 1/2" 1.44MB Diskette Drive
- 101 Key Keyboard
- Pre-Installed DOS 5.0, Windows 3.1 & Mouse
- CompaqCare

\$919 141650-006

Monitor Not Included.

Optional Accessories

Kingston 2MB Memory KTC-PLSX/2	\$109
Kingston 8MB Memory KTC-PLSX/8	\$329
Practical Peripherals 2400 bps with 9600 Send/Receive Fax Int. DI-PM24FX96	\$89
Practical Peripherals 14.4 Baud with 9600 Send/Receive Fax Int. DI-PM14FX	\$359
COMPAQ 5 1/4" Diskette Drive 141740-001	\$89
Samsung SyncMaster 2, 14", .39mm, 1024 x 768, Color Monitor DI-CVM4963	\$249
Samsung SyncMaster 3, 14", .28mm, 1024 x 768, Color Monitor DI-CVM4967	\$299



* Special Federal Express rates apply to cpu and keyboard only.

COMPAQ Contura 3/25...Designed To Fit Your Budget! Now In Color, Too

COMPAQ Contura 3/25

- Intel386™ SL 25MHz Microprocessor
- 64K Cache
- 4MB RAM Expandable to 12MB
- 9.5" Monochrome VGA Display, 16 grey Shades, 640 x 480
- 3 1/2" 1.44MB Diskette Drive
- Enhanced NiCD Battery Pack Operates 3 Hours
- 79/80 Key Keyboard
- 8.9" D x 11.7" W x 1.9" H, 6.2 lbs.
- Dos 5.0, Windows 3.1, PFS: WindowWorks & Trackball
- CompaqCare

\$2069 139400-006

COMPAQ Contura 3/25c Same as Above Only With 9" Color Display, 640 x 480, NiMH Battery Operates 3 hours, 8.9" D x 11.7" W x 2.1" H, 6.7 lbs. PFS: WindowWorks Not Included.

84MB Hard Drive \$2359 139410-004
120MB Hard Drive \$2639 139410-005

Optional Accessories

Kingston 2MB Mem. KTC9769/2	\$149
Kingston 4MB Mem. KTC9796/4	\$179
Kingston 8MB Mem. KTC9769/8	\$349
Megahertz 2400 bps Int. DI-C524	\$149
Megahertz 2400 bps with V.42 BIS DI-C524M	\$189
Megahertz 9600 bps with 9600 Send/Receive Fax DI-C596FM	\$489
COMPAQ Carrying Case 138058-001	\$62
COMPAQ AC Adapter 139500-001	\$92
COMPAQ Automobile Adapter 139501-001	\$109
COMPAQ External Battery Charger 139506-001	\$92



COMPAQ LTE Lite/25c...The Color Notebook You've Been Waiting For!

COMPAQ LTE Lite/25C

- Intel386™ SL 25 MHz Microprocessor, 64K Cache
- 4MB RAM Expandable to 20MB
- 8.4" Active Matrix Color VGA Display
- 3 1/2" 1.44MB Diskette Drive
- NiMH Battery Operates 2.5 Hours
- 101/102 Key Keyboard
- 8.5" D x 11.0" W x 2.0" H, 6.5 lbs.
- Pre-Installed DOS 5.0 & Windows 3.1
- Easy Point Trackball
- CompaqCare

\$3299 138250-003
120MB Hard Drive \$3599 138250-004

Optional Accessories

Kingston 2MB Memory KTC9497/2	\$119
Kingston 4MB Memory KTC9497/4	\$179
Kingston 8MB Memory KTC9497/8	\$349
Megahertz 2400 bps Int. DI-C524	\$149
Megahertz 2400 bps with V.42 BIS DI-C524M	\$189
Megahertz 9600 bps with 9600 Send/Receive Fax DI-C596FM	\$489
COMPAQ Carrying Case 138058-001	\$62
COMPAQ AC Adapter 129741-001	\$129
COMPAQ Automobile Adapter 129762-001	\$92
COMPAQ Ext. Battery Charger 129742-001	\$86
COMPAQ Expansion Base 133600-001	\$589



CALL

USA FLEX
COMPAQ HOTLINE
Code # PM01B3

1-800-677-8575

Open 24 Hours Mon.-Fri.,
Sat. & Sun. 9am to 4pm

FAX (708) 351-7204
Gov't & Education Sales 1-800-395-7025
Gov't & Education FAX (708) 351-9871
Habla Espanol
1-800-723-5500 • (708) 924-6780

GET TO START YOUR OFF RIGHT... FROM USA FLEX!



COMPAQ SLT 386s/20

- Intel®386™ SX 20MHz Microprocessor
- 4K Cache
- 2MB RAM Expandable to 14MB
- 10" COMPAQ VGA Backlit Display
- 3 1/2" 1.44MB Diskette Drive
- NiCD Battery Operates 3 hours
- Detachable Keyboard with Full Size Keys
- 14 lbs
- DOS 5.0*, Windows 3.1, Mouse & Mouse Pad
- CompaqCare

60MB
Hard Drive
SLT60-BUN

\$1099

120MB Hard Drive **\$1199**
SLT120-BUN

Optional Accessories

Kingston 1MB Memory KTC/SLT386-1	\$89
Kingston 2MB Memory KTC/SLT386-2	\$169
Kingston 4MB Memory KTC/SLT386-4	\$219
Megahertz Pocket Modem 2400 bps with 9600 Send/Receive Fax with V.42 BIS	
DI-P224PMV	\$249
Megahertz Pocket Modem 9600 bps with 9600 Send/Receive Fax with V.42 BIS	
DI-P296PMV	\$489
Practical Peripherals 2400 bps Modem	
DI-PM24PPM	\$104
Practical Peripherals 2400 bps Modem 9600 Send Fax Only DI-24V42PPM	\$149
Expansion Base 110059-001	\$689



COMPAQ LTE 386s/20

- Intel386™ SX 20MHz Microprocessor
- 4K Cache
- 2MB RAM Expandable to 10MB
- 9" COMPAQ VGA Edgelit LCD Display
- 3 1/2" 1.44MB Diskette Drive
- NiCD Battery Operates 3 hours
- Enhanced Keyboard
- 7.5 lbs
- DOS 5.0*, Windows 3.1, Mouse & Mouse Pad
- CompaqCare

60MB
Hard Drive
LTE60-BUN

\$1299

Optional Accessories

Kingston 1MB Memory KTC/LTE386s-1	\$94
Kingston 2MB Memory KTC/976912	\$159
Kingston 4MB Memory KTC/LTE386s-4	\$229
Megahertz Modem 2400 bps with V.42 BIS DI- C424M	\$159
Megahertz Modem 2400 bps	
DI-C424	\$124
Megahertz Modem 9600 Send/Receive Fax, 2400 bps with V.42 BIS	
DI-C424PM	\$249
Expansion Base 133600-001	\$589



COMPAQ DESKPRO 386/20e

- Intel386™ DX 20MHz Microprocessor
- 32K Cache
- 4MB RAM Expandable to 16MB
- Samsung SyncMaster 2, 14", .39mm, 1024 x 768, Color Monitor
- 3 1/2" 1.44MB Diskette Drive
- 101 Key Keyboard
- 4 Expansion Slots
- DOS 5.0*, Windows 3.1, & Mouse
- CompaqCare

DPSYNC2

\$1299

COMPAQ DESKPRO 386/20e with the
Samsung SyncMaster 3, 14", .28mm, 1024 x
768, Color Monitor **\$1349**

DPSYNC3

Optional Accessories

Kingston 1MB Module (80NS) KTC1000	\$89
Kingston 4MB Module (80NS) KTC4100 ..	\$199
Kingston 1MB Memory Board KTC1000E	\$119
Kingston 4MB Memory Board KTC4000E	\$249
Practical Peripherals 2400 bps with 9600 Send/ Receive Fax Internal Modem	
DI-PM24FX96	\$89
Practical Peripherals 14.4 Baud with 9600 Send/ Receive Fax Internal Modem	
DI-PM14FX	\$359

COMPAQ

FLEX Advantages

- 15 Years of the Service and Support You Expect
- 30 Day Money Back Guarantee
- Friendly, Knowledgeable Sales Staff
- Over 300,000 Satisfied Customers
- Unlimited Toll Free Technical Support
24 Hours a Day, 7 Days a Week.

CompaqCare

- Included FREE With All COMPAQ Systems**
- Free 1 Year On-Site Limited Warranty
 - Worldwide Limited Warranty on
COMPAQ Portables Only

FEDEX® Economy Two-Day™ Delivery
Service for as low as \$14.95 per package.
Special \$14.95 rate available on any
package up to 32 lbs.



Look for the Federal Express Logo for all
products that qualify. Ask your sales
representative for details.



Flex Fax Automated Fax Retrieval System

- Details and specs about our products and services
- Helpful hints and answers to technical support questions
- Monthly Specials **FLEX FAX # (708) 351-5419**

All products or services are identified by the trademarks or
service marks of their respective companies. All prices and
specifications are subject to change without notice. Shipping
and handling charges additional. The Intel Logo is a reg-
istered trademark of Intel Corporation. Refer to code number
when placing an order. USA FLEX • 471 Brighton Drive,
Bloomington, IL 60108

Code # PM01B3



CIRCLE 051 ON READER SERVICE CARD

★ MONITOR BUNDLE SPECIAL



MAG InnoVision
15" MAG Monitor and
ATI Video Card Bundle

MAG InnoVision's 15" MX15F **\$879**
Multi-frequency Color Monitor
• 1280 x 1024 Non-interlaced
• Flat Square Tube with INVAR
shadow mask and non-glare etched screen
• .28mm Dot Pitch
ATI Graphics ULTRA
• 1 MB VRAM • OEM box and manual

★ MONITORS



14" C1381I .28mm, 1024 X 768 Int. **\$329**
14" C1395 .28mm, 1024 X 768 NI **\$449**

★ SAMSUNG

12" Amber Mono 720 X 350 **\$69**
14" ML4571 White VGA, 640 X 480 **\$119**
14" CVL4955 .41mm, 640 X 480 **\$219**
14" SM 2 .39mm, 1024 X 768 Int. **\$249**
14" SM 3 .28mm, 1024 X 768 Int. **\$299**
14" SM 3n .28mm, 1024 X 768 NI **\$349**
15" SM 15 .28mm, 1024 X 768 NI **\$479**
17" SM 4 .31mm, 1024 X 768 NI **\$799**

★ NEC

14" 2A .31mm, 800 X 600 **\$399**
15" 3FGx .28mm, 1024 X 768 NI **\$629**
15" 4FG* .28mm, 1024 X 768 NI **\$739**
17" 5FG* .28mm, 1280 X 1024 NI **\$1249**
21" 6FG* .28mm, 1280 X 1024 NI **\$2299**

★ CTX *Microprocessor based

14" 5468 .28mm, 1024 X 768 Int. **\$279**
14" 5468NI .28mm, 1024 X 768 NI **\$309**
15" CPS 1560* .28mm, 1024 X 768 NI **\$489**
17" 1760LC Proscan*
.31mm, 1280 X 1024 NI **\$789**
17" 1760 Proscan*
.28mm, 1280 X 1024 NI **\$829**

MAG InnoVision Microprocessor based Monitors
15" MX15F .28mm, 1280 X 1024 NI **\$599**
15" MX17F .26mm, 1280 X 1024 NI .. **\$1099**

★ SONY

14" CPD-1320 .25mm, 640 X 480 **\$339**
14" CPD-1304 .25mm, 1024 X 768 NI .. **\$599**
17" CPD-1604S .25mm, 1024X768 NI **\$1049**

★ REFURBISHED MONITORS

All monitors include a 30 day warranty!

NEC **SONY**
15" 3FGx CALL **14" CPD-1304** .. **\$499**
15" 4FG CALL
20" XL **\$999**

★ MATH COPROCESSORS

intel **80287-XL** 8, 10, 16, 20 MHz **\$89**
80387-DX 16, 20, 25, 33 MHz **\$89**
80387-SX 16, 20, 25 MHz **\$85**
80487-SX 20, 25 MHz **\$479**

INTEGRATED INFORMATION
2C87-10 MHz **\$59** **3C87SX-33** MHz **\$75**
2C87-12 MHz **\$69** **3C87-25** MHz **\$79**
3C87SX-20 MHz **\$75** **3C87-33** MHz **\$79**
3C87SX-25 MHz **\$75** **3C87-40** MHz **\$99**

★ SOUND CARDS

Sound Blaster 1.5 D1-BLASTER **\$95**
Sound Blaster PRO Basic D1-BLASTER-PB **\$145**
Sound Blaster PRO D1-BLASTER-P **\$185**
Sound Blaster 16 D1-BLAST16 **\$239**

USA FLEX... FOR SOLUTIONS THAT

★ VIDEO CARDS

SpeedSTAR24 - 1MB VGA
D1-DSS/24 **\$135**
SpeedSTAR24X - 1MB VGA
D1-DSS/24X **\$189**
Stealth High Color - 1MB VGA
D1-DST/1MB **\$219**

PARADISE 16-Bit SVGA Windows
Accelerator Board 1MB
D1-PARADISE **\$159**

ProDesigner II/s - 1MB
D1-ORCH/PRO **\$149**
Fahrenheit 1280 - 1MB
D1-ORCH/FH **\$199**
Fahrenheit VA - 1MB
D1-ORCH/VA **\$299**

ATI VGAWONDER XL24™ - 1MB
D1-ATI/WRD24 **\$149**
ATI GRAPHICS ULTRA™ - 1MB
D1-ATI/G/ULT **\$299**

ATI GRAPHICS ULTRA™ PLUS- 2MB
ATI/G/ULT+ **\$319**
ATI GRAPHICS ULTRA™ PRO - 2MB
ATI/G/ULTPRO **\$499**

★ MODEMS

POCKET EDITION™ 2400 125450 **\$119**
OPTIMA 24/SC EZ 125488 **\$129**
OPTIMA 96/SC EZ 125467 **\$349**
OPTIMA™ 96 + FAX96 125479 **\$379**
OPTIMA™ 144+ FAX144 125478 **\$489**

2400 Baud
INT D1-PM2400 *79 EXT D1-PM2400SA *99
2400 Baud V.42 bis
INT D1-PM2400V42 *109 EXT D1-PM24SAV42*129
2400/9600 Send/rec. Fax
INT D1-PM24FX96 *89 EXT D1-PM24FX96SA *99
9600 Baud V.32/V.42 bis
INT D1-PM9600 *285 EXT D1-PM9600SA *279
14,400 modem/9600 fax V.32 bis
INT D1-PM14FX *359 EXT D1-PM14FXSA *389

TWINCOM™
2400/9600 Send/rec. Fax
INT D1-TCOM24/96 *109 EXT D1-TC24/96E *119
14,400 fax V.42 bis EXT D1-TC14.4 *299

★ MicroSolutions BACKPACK EXT. DRIVES

Plug 'N Play - No Slot Drives
Floppy Drive 3.5" 1.44 MB D1-BP1.44 **\$199**
Floppy Drive 5.25" 1.2 MB D1-BP1.2 **\$199**
Floppy Drives require DOS 2.0 or above
Tape Drive
80/250 MB w/Data Comp. D1-BP80/TD .. **\$439**
Hard Drive 40 MB D1-BP40HD **\$439**
Hard Drive 100 MB D1-BP100/HD **\$519**
Tape and Hard Drives require DOS 3.0 or above

★ DRIVES

Seagate HARD DRIVES
ST351A/X 42.8MB, IDE **\$169**
ST3120A 106.9MB, 15ms, IDE **\$259**
ST3144A 130MB, 16ms, IDE **\$274**
ST3283A 245MB, 12ms, IDE **\$539**
ST1480A 426MB, 14ms, IDE **\$829**
ST3283N 248MB, 12ms, SCSI **\$569**
ST1401N 338MB, 12ms, SCSI **\$829**
ST1480N 426MB, 14ms, SCSI **\$1049**
BOCA IDE Floppy Controller **\$29**
Adaptec SCSI Host adapter kit **\$139**
Cable and frame kit sold separately. Ask for pricing.

★ KINGSTON MEMORY

Kingston Laser Printer and System Memory
available from USA Flex. Call for details.

★ PRINTERS

IBM® LASER PRINTERS BY LEXMARK™
LaserPrinter E - 5 ppm, 10 fonts, 512K,
300 dpi 4019E01 **\$749**
LaserPrinter - 10 ppm, 10 fonts, 512K,
300 dpi 4019001 **\$1189**
LaserPrinter SE - 5 ppm, 26 fonts, 1MB,
300 dpi 4029010 **\$919**
LaserPrinter 6 - 6 ppm, 27 fonts, 1MB,
300 dpi* 4029020 **\$1189**
LaserPrinter 10 - 10 ppm, 27 fonts, 1MB,
300 dpi* 4029030 **\$1259**
LaserPrinter 10L - 10 ppm, 27 fonts, 1MB,
300 dpi* 4029040 **\$1499**
*Exp. up to 600 dpi with the addition of 5MB +
PostScript.

IBM DOT MATRIX PRINTERS BY LEXMARK™
Model 2380 - N-carr., 240 X 144 dpi,
320 cps, 65-NLQ, 4 fonts 2380001 **\$329**
Model 2381 - W-carr., 240 X 144 dpi,
320 cps, 65-NLQ, 4 fonts 2381001 **\$459**
Model 2390 - N-carr., 360 dpi, 200 cps,
60-LQ, 8 fonts 2390001 **\$329**
Model 2391 - W-carr., 360 dpi, 200 cps,
60-LQ, 8 fonts 2391001 **\$459**
IBM PORTABLE PRINTERS BY LEXMARK™
2.5 lbs. with battery, 360 dpi, battery operated,
53 LQ, 1 year Lexmark™ Express Service
Black 5183010 or White 5183020 **\$349**

★ EPSON LASER PRINTERS

ACTION LASER II - 6 ppm,
14 fonts, 300 dpi, 512K.. **\$699**
EPL-8000 -
10 ppm, 14 fonts, 300 dpi, 1MB **\$1099**
EPL-7500 PS - LIMITED QUANTITY
6 ppm, 35 fonts, 300 dpi, 512K **\$1099**
EPSON DOT MATRIX PRINTERS
AP 2250 N-carr., 240 X 144 dpi, 3 fonts **\$139**
LX-810 N-carr., 240 X 216 dpi, 3 fonts .. **\$169**
AP 3250 N-carr., 360 dpi, 6 fonts **\$189**
FX-870 N-carr., 240 X 216 dpi, 4 fonts ... **\$288**
FX-1150 W-carr., 240 X 216 dpi, 4 fonts **\$389**
LQ-570 N-carr., 360 dpi, 12 fonts **\$264**
LQ-1070 W-carr., 360 dpi, 12 fonts **\$379**
LQ-870 N-carr., 360 dpi, 12 fonts **\$429**
LQ-860 Color N-carr., 360 dpi, 4 fonts ... **\$554**
LQ-1170 W-carr., 360 dpi, 12 fonts **\$589**
LQ-2550 Color W-carr., 360 dpi, 8 fonts **\$889**
DFX-5000 W-carr., 240 X 216 dpi,
533* cps, 80-NLQ, 3 fonts **\$1,269**
DFX-8000 same as DFX-5000 with
1066* cps and 192-NLQ **\$2,139**
* Super draft mode ** Your cost after \$10 mail-in
rebate from Epson.

Dataproducts LASER PRINTERS
LZR 960 PostScript, 9 ppm, 2 MB, 35 fonts,
300 dpi **\$1399**
LZR 965 PostScript, 9 ppm, 35 PostScript &
6 PCL fonts, 8MB, 300/600 dpi **\$2399**
LZR 1560 PostScript, 15 ppm, 35 fonts,
11 x 17, 4 MB, 300/400 dpi **\$2999**
LZR 1555 15 ppm, 13 scalable & 14 bitmap
fonts, 11 x 17, 4 MB, 300/400 dpi **\$2999**
DATAPRODUCTS DOT MATRIX PRINTERS
LX 455™ 33-pin, up to 750 LPM, 6 fonts **\$699**

star DOT MATRIX PRINTERS
NX-1040 Rainbow - 7 Colors, 9 pin, 10 fonts,
180 cps in draft **\$164**
NX-2430 Multi-Font - 24 pin, 11 res. &
13 scalable fonts, 240 cps in draft **\$229**
Starjet SJ-48 Inkjet Printer - 64 nozzles, 4 res.
& 13 scalable fonts, 166 cps in NLQ **\$295**
NX-2420 Rainbow - 7 Colors, 24 pin, 7 fonts,
250 cps in draft **\$299**

★ SAMSUNG LASER PRINTER

Finale™ 8000 - Intel i960i™ 16 MHz RISC
processor, 8 ppm, 300 dpi, Windows 3.1
comp., 35 PostScript fonts, 2MB RAM . **\$1349**

ARE MORE THAN JUST SYSTEMS!

★ PRINTERS

NEC LASER PRINTERS

Silentwriter Model 95FX

PostScript printer, 6 ppm, 35 scalable Adobe fonts, 14 bitmap fonts, 8 scalable HP fonts, 300 dpi, 2MB and built in env. feeder, Built-in send & rec. fax cap. **'1849**
Silentwriter Model 95 **'1399**

Silentwriter Model 990 - NEW LOW PRICE

PostScript printer, RISC processor, max. 8 ppm, 35 scalable Adobe fonts, 14 bitmap fonts, 300 dpi, 2MB and 200 sht. letter cass. **'1199**

NEC DOT MATRIX PRINTERS

24-Pin Pinwriter® Printers with 360 DPI

P3200 N-carr., 8K, up to 216 cps **'229**
P3300 W-carr., 8K, up to 216 cps **'329**
P6200 N-carr., 80K, up to 300 cps **'409**
P6300 W-carr., 80K, up to 300 cps **'629**
P9300 W-carr., 80K, up to 400 cps **'829**

Canon BUBBLE JET PORTABLE PRINTERS

BJ-10ex 360 dpi, 37K, 6 fonts, 142 cps. **'285**
BJ-200 360 dpi, 49K, 10 fonts, 496 cps **'349**
BJ-200 360 dpi, 37K, 7 fonts, 188 cps, plus auto sheet feeder **'369**

BJ-300/330 360 dpi, 30K, 3 fonts, 600 cps

BJ-300 (nar-carr.) **'409** **BJ-330** (wide-carr.) **'559**

BJC-800/820 Color Prints 11 x 17, 360 dpi, 7K, built-in auto sheet feeder, 600 cps

BJC-800 (parallel interface) **'1799**

BJC-820 (scsi interface) **'1929**

Canon LASER BEAM PRINTERS

LBP-4SX 4 ppm, 300 dpi, 1 MB, 4 scalable typefaces & 3 bitmap fonts, 70 sht. multi-purpose paper tray, 26 lbs. **'899**

LBP-8SX 8 ppm, 300 dpi, 1 MB, 3 scalable typefaces & 3 bitmap fonts, 200 sht. letter cass., 44 lbs. **'1299**

Panasonic LASER PRINTERS

KX-P4410 5 ppm, 28 fonts, 300 dpi, 512K **'619**
KX-P4430 5 ppm, 28 fonts, 300 dpi, 1MB **'859**

KX-P4450I 11 ppm, 28 fonts, 300 dpi, 512K **'1049**

KX-P4455 PS 11 ppm, 39 fonts, 300 dpi, 512K **'1669**

Panasonic DOT MATRIX PRINTERS

KX-P1180I N-carr., 240x216 dpi, 6 fonts **'154**

KX-P2180 N-carr., 240x216 dpi, 9 fonts **'159**

KX-P1123 N-carr., 360 dpi, 7 fonts **'194**

KX-P2123 N-carr., 360 dpi, 10 fonts **'239**

KX-P1124I N-carr., 360 dpi, 10 fonts **'275**

KX-P2124 N-carr., 360 dpi, 12 fonts **'305**

KX-P1624 W-carr., 360 dpi, 7 fonts **'335**

KX-P1695 W-carr., 240x216 dpi, 8 fonts **'359**

KX-P1654 W-carr., 360 dpi, 10 fonts **'534**

KX-P2624 W-carr., 360 dpi, 11 fonts **'359**

★ IBM® L40 386 SX

IBM Quality and Reliability!
Easy to setup and use!

20MHz 386 SX, 2 MB RAM, 80 MB HD, 640 x 480 VGA, 1.44 MB Floppy, MS-DOS 5.0, 7.7 lbs including battery, FREE leather carrying case **'1299**

Special Portable Bubble Jet Printer '269

★ CD ROM DRIVES

MAGNAVOX Combo External CD-ROM & CD-Audio Player W/Software!

- MS DOS extensions
- Driver software
- Interface card & cable
- <700ms access time
- Works with 8 or 16 bit PCs
- CD audio playback w/front panel controls

Only... \$399

Software packages included FREE!

The GROlier Electronic Encyclopedia™
 Microsoft® Bookshelf™, PC Globe Pak™
 The PC-Sig Library (Version 9) D1-CDD461RS

SONY INTERNAL & EXTERNAL

MPC standards, 340ms, dust proof construction, built-in audio, layered error correction code, includes Sony interface card

Int. D1-535-K **'345** Ext. D1-7205-N **'459**

MITSUMI INTERNAL & EXTERNAL

700ms, 8-bit bus interface card, controller card, cable & device driver, multi-media supported, audio playback, dust proof patented.

Int. D1-1085 **'199** Ext. D1-1096 **'299**

NEC INTERNAL & EXTERNAL

280ms access time, 300KB/second data transfer rate, MPC compliant, 2 year warranty, 64K cache, AT interface card

Int. D1-CDR-84 **'579** Ext. D1-CDR-74 **'629**

Ext. D1-CDR73M-XT **'549**

CD-ROM SOFTWARE SPECIAL

Buy any Sony, NEC or Mitsumi CD ROM drive listed above and receive any CD titles listed through FLEXFAX at a special package price. If you already own a CD ROM drive you may purchase these titles at a low discount prices.

NEW FLEXFAX Automated Fax Retrieval System

- Details and specs about our products and services
- Helpful hints and answers to technical support questions
- Monthly Specials

FLEXFAX # (708) 351-5419

24 hours a day, 7 days a week.

HP FAX MACHINES & ACCESSORIES

★ HP FAX MACHINES & ACCESSORIES

HEWLETT PACKARD



HP FAX-200 Plain-paper, cut sheet printing, 12 page memory **'959**

HP FAX-310 Plain-paper, cut sheet printing, 28 page memory **'1129****

\$150 Rebate
 On HP FAX-310

HP FAX-310
'1279

- \$150

'1129

Your Cost After Mail-In Rebate**

Offer ends 2/28/93

'1129**

Black Toner Cartridge

LaserJet II, IID, III IID 92295A **'79** **'76**

LaserJet IIP & IIIP 92275A **'61** **'59**

LaserJet 92285A **'62** **'79**

LaserJet IIISI 92291A **'119** **'115**

Paper Trays

Letter (250 Sheets) **'52** **'49**

Legal (250 Sheets) **'60** **'59**

Envelope (15 env.) **'70** **'65**

Miscellaneous

IIP/IIIP Lower Cassette (250 Shts) **'139.00**

DeskJet Ink Cartridge **'16.95**

NEW DeskJet High Capacity Ink Cart **'27.95**

NEW DeskJet Color Cartridge **'29.95**

Quantity

1-3 **+4**

'79 **'76**

'61 **'59**

'62 **'79**

'119 **'115**

'52 **'49**

'60 **'59**

'70 **'65**

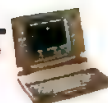
*Requires Lower Cassette.

Minimum Order \$80. MasterCard, Visa, Discover and Plus Cards accepted for sales in continental USA, Alaska, Hawaii, Canada, APO, FPO and Puerto Rico. (A \$10.00 surcharge on credit card orders for APO, FPO and Puerto Rico). Shipping available for qualified businesses. Shipping and handling additional. Corporate rates 10% or better and government discounts 15% or better. All prices are in U.S. dollars and include all taxes, duties, and handling charges. Call for nearest UPS Red and Blue C.O.D. rates. Call for PAL rates. All prices are in U.S. dollars and include all taxes, duties, and handling charges. All prices and specifications are subject to change without notice. \$10.00 minimum shipping and handling. \$100 is a registered trademark of International Business Machines Corporation and used under license. Lexmark is a trademark of Lexmark International, Inc. Please refer to circle numbers when placing an order.

USA FLEX • 471 Brighton Drive, Bloomington, IL 60108

★ TOSHIBA LAPTOPS

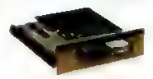
MICROSOFT MS-DOS 5.0
 included on all systems



T1800 LCD i386SX-20, 60MB, 2MB RAM PC1030U-0A '1529	
T1850 LCD i386SX-25, 4MB RAM 80MB PC1033U-0A '1859	
120MB PC1034U-0A '2079	
T1850C Color i386SX-25, 4MB RAM 80MB PC1033U-X1A '2329	
120MB PC1034U-X1A '2539	
T3300SL LCD i386SL-25, 2MB RAM 80MB PC23-PA1066U '1949	
120MB PC23-PA1067U '2129	
T4400SX LCD i486SX-25, 2MB RAM 80MB PC24-PA1102U '2199	
120MB PC24-PA1103U '2369	
T4400SX Plasma i486SX-25, 2MB RAM 80MB PC24-PA1102UW '2369	
120MB PC24-PA1103UW '2549	
T4400SXC Color, 4MB RAM i486SX-25, 80MB PC24-PA1102UX '3049	
i486DX-25, 120MB PC24-PA1103UX '3219	
T4400C Color i486SX-25, 4MB RAM 120MB PC24-PA1103UXT '3389	
200MB PC24-PA1150UXT '4069	
T4500 LCD i486SX-20, 4MB RAM 80MB PC1107U-M2A '2369	
120MB PC1108U-M2A '2549	
T4500C Color i486SX-20, 4MB RAM 120MB PC1108U-X2A '3729	
*T6400SX/T6400SXC i486SX-25, 4MB RAM Plasma 120MB PC25-PA1560U '3389	
Color 120MB PC25-PA1560UX '5599	
*T6400DX/T6400DXC i486DX-33, 4MB RAM Plasma 200MB PC25-PA1601U '4149	
Color 200MB PC25-PA1601UX '6359	
*AC power only - Does not run on batteries.	

★ TAPE BACK UP

COLORADO MEMORY SYSTEMS INC.



JUMBO 120 - 120MB storage capacity INT. D1 JUMBO '189	
EXT. D1 JUMBO & D1 KE-10 '285	
JUMBO 250 - 250MB storage capacity INT. D1 D1-20 '250	
EXT. D1 D1-20 & D1 KE-10 '347	
JUMBO TRAKKER™ - Plug and play, no hardware to install. Works with any computer with an IBM® parallel printer port.	
120MB D1-JT10 '339 250MB D1-JT20 '409	
NEW POWERTAPE™ - 4 gigabyte capacity INT. D1-PT 50 EXT. D1-PT 50 CALL	
4 GB Data Cartridge 5DT-4000 '49	

★ 3M DATA CARTRIDGES

FREE 3M Data Cartridge!	
FREE 3M Head Cleaning Diskette!	
Call USA Flex for details.	
DC2000-40/80MB '16.99 Form. '16.95	
DC2080-80/160MB '21.95 Form. '24.95	
DC2060-60MB Form '25.95	
DC2120-120/250MB '23.95 Form. '26.95	
DC600A '20.49 DC300XLP '18.69	
DC6150-250/500MB '21.49	
DC6250-250/500MB '25.49	
DC6525-350/700MB '32.95	

USA FLEX

TO ORDER 1-800-766-1940

FAX # (708) 351-7204

Government/Ed. Sales 1-800-395-7025

Government/Ed. FAX (708) 351-9871

Habla Espanol 1-800-723-5500

Code # PM01B3



Databases...Graphics...Networking

spots that aren't always obvious.

The product costs \$49.95 and comes with the FoxPro source code. For more information, contact Harless Software, 7373 Jefferson Hwy. #29, Harahan, LA 70123; 504-738-9172.—*Sal Ricciardi*

Graphics

PREDICTING POSTSCRIPT PROBLEMS

❓ I use CorelDraw and have no trouble generating printouts on my 300-dpi laser printer. But my service bureau sometimes has difficulty generating the same file on a high-resolution Linotronic typesetter. Why does this happen? Is there any way to predict which files are going to be a problem?

*D. Burns
Pittsburgh, Pennsylvania*

► **PC MAGAZINE:** PostScript printer files are actually programs. The PostScript interpreter (also called a RIP for raster image processor) that resides in the printer executes the program and produces the paper output. In many ways the PostScript interpreter residing in your desktop laser printer is identical to the PostScript interpreter buried within a Linotronic imagesetter. It is this similarity that allows you to produce fairly accurate, low-resolution proofs in the comfort of your office.

However, curves that are acceptable at 300 dpi become extremely complex when the resolution jumps to 1,200 or 2,400 dpi. The reason? Not only does an imagesetter produce many more dots per inch than your laser printer, but it executes the PostScript drawing instructions with many more curve segments per line. So it's quite possible for a file to print without a hitch on your laser printer, but fail to print at your service bureau.

Luckily, CorelDraw does allow you to predict whether a file will successfully print out on a Linotronic device with a fair degree of accuracy. Within the Print dialog box there's a section titled Flatness. If you increase the Flatness setting from the default of 1.00, you'll decrease the complexity of the curves. Conversely, if you decrease the Flatness setting you'll

increase the complexity of the curves—in effect simulating a high-resolution device.

At a resolution of 300 dpi, a flatness setting of 0.25 will really put the PostScript interpreter through its paces. And you'll know if the picture has the potential to bomb on an imagesetter because it will bomb first on your own laser printer. Typically, flashing lights on your printer alert you to the fact that the PostScript interpreter is processing the image. But instead of a printout the machine will simply revert to the ready mode.

Even if the image prints, the output from your laser printer won't look any different to you—after all, 300 dpi is 300 dpi, no matter how fine the calculations performed by the interpreter. But if a picture prints with this flatness setting, chances are pretty good it will also print at your service bureau.

Don't lose heart if you discover potential printing problems. You can take one of three different approaches to ensure that your picture will print at high resolutions. First you can increase the Flatness setting. (But be warned: If you increase flatness too much you may degrade the quality of curved lines in your drawing.)

Second, you can simplify PostScript objects on a global basis by lowering the value of the PSComplexity Threshold statement in the Coreldrw.ini file. You can make this change using any text editor (like the Windows Notepad) that can read and write ASCII. However, don't make any changes until you consult with your service bureau to discover the optimum value.

Perhaps the best solution involves editing the drawing itself. Look for objects that contain very complex curves or lots of Bezier nodes, such as long text strings you've converted to curves. Then use the Break Apart command to turn complex curves into a series of smaller, simpler curve segments.—*Luisa Simone*

Networking

CHECKING RPRINTER—AGAIN

❓ TIP An item in your August 1992 column contained the fairly complicated method a reader used to check for the presence of NetWare's RPRINTER re-

mote print server. The listing shown below is my solution to the problem:

```
IPX.COM
NETX.COM
:RETRY
RPRINTER PRINTSERVER 1
IF NOT ERRORLEVEL 1 GOTO OK
ECHO Retrying Remote Printer
Initialization
ECHO PleaseWait
GOTO RETRY
:OK
F:
LOGIN
```

This short listing provides the same service, but I think you'll find that it's much easier to understand and to install.

*Kevin Chester
Calgary, Alberta, Canada*

► **PC MAGAZINE:** The RPRINTER service often comes back up slowly after a failure. The technique described in the August issue slowed down and counted the number of retries using one batch file that called another—a method that several readers found too complex. The solution suggested in this note is typical of the messages we received.

The technique illustrated here reduces the complexity by simply employing a GOTO loop inside of AUTOEXEC.BAT, but it generates a great deal more network traffic. Still, if your network isn't busy, this approach works just fine.—*Frank J. Derfler, Jr.*

THE AIRPORT PHONE MODEM MYSTERY, PART II

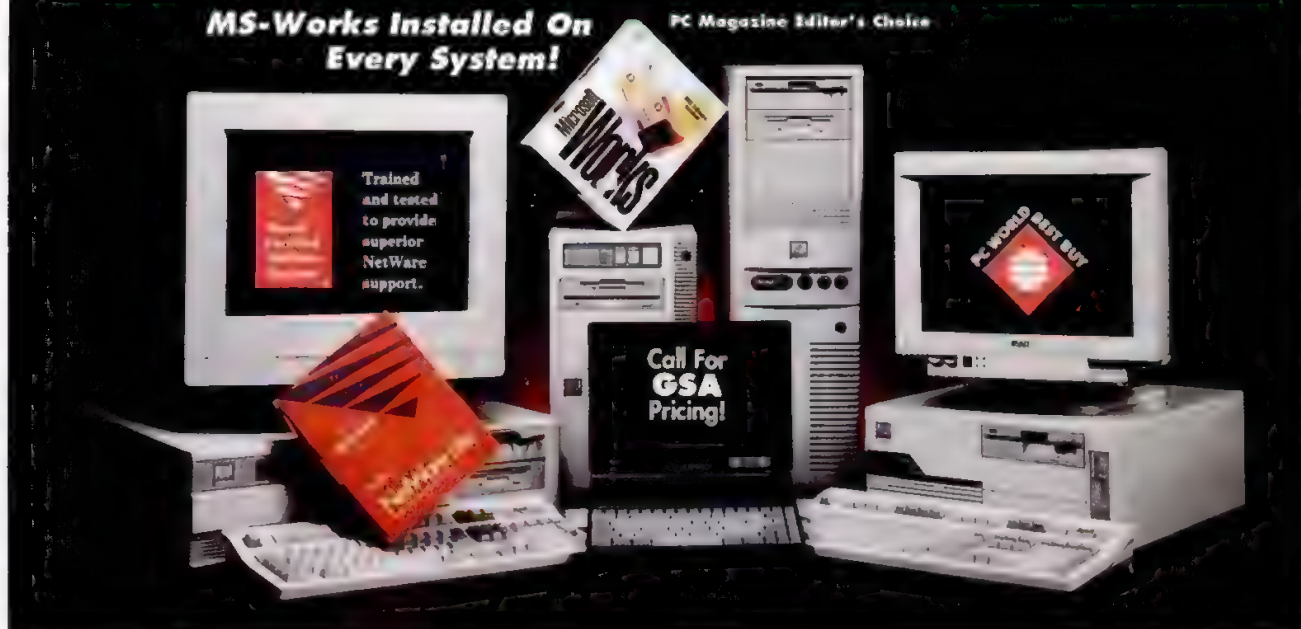
❓ TIP In the August 1992 issue you printed advice on completing a modem connection through an AT&T public telephone equipped with a modem jack. The suggestions helped, but I think that the explanation of the modem command needs some refinement.

ATX0D isn't an extension of the ATXn command, but rather the combination of it and ATD (which dials the modem). ATXn commands don't set result codes; they tell the modem how to interact with the various tones (such as dial) provided by the telephone network. One such directive means, for example, listen/

VESA LOCAL BUS .. TEN TIMES THE SPEED
CALL FOR VESA LOCAL BUS!

**MS-Works Installed On
 Every System!**

PC Magazine Editor's Choice



ADVICE FOR LOCAL BUS USERS: DON'T BLINK, YOU'LL MISS IT!

ACMA 486SX-25MHz

- 4MB RAM
- 1.2MB & 1.44MB floppy drives
- 120MB IDE hard drive
- Super VGA color monitor (1024 x 768, N.I.)
- Super VGA card with 1MB
- DOS 5.0, Windows 3.1, MS-Works, & Glossary
- 101-keyboard & high-resolution serial mouse

NOW ONLY \$1,495

ACMA 486-33MHz

- 4MB RAM
- 1.2MB & 1.44MB floppy drives
- 210MB IDE hard drive
- Super VGA color monitor (1024 x 768, N.I.)
- Super VGA card with 1MB
- DOS 5.0, Windows 3.1, MS-Works, & Glossary
- 101-keyboard & high-resolution serial mouse

ISA \$1,895 -- EISA \$2,195

**PC WORLD BEST
 BUY WINNER!**

**Tests Prove Acma's
 486DX2-50MHz Is Faster Than
 Compaq, Gateway, Dell,
 CompuAdd, & Northgate!**

**BEST BUY 10/92
 486DX2-50MHz**

**BEST BUY 11/92
 486SX-25MHz**

ACMA 486DX2-50MHz

- 4MB RAM
- 1.2MB & 1.44MB floppy drives
- 210MB hard drive
- Super VGA monitor (1024x768, N.I.)
- Super VGA card with 1MB
- DOS 5.0, Windows 3.1, MS-Works, & Glossary
- 101-key keyboard & high-resolution serial mouse

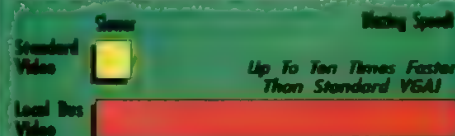
NOW ONLY \$1,995

ACMA 486-50MHz

- 4MB RAM
- 1.2MB & 1.44MB floppy drives
- 210MB IDE hard drive
- Super VGA color monitor (1024 x 768, N.I.)
- Super VGA card with 1MB
- DOS 5.0, Windows 3.1, MS-Works, & Glossary
- 101-keyboard & high-resolution serial mouse

ISA \$2,195 -- EISA \$2,395

**VESA LOCAL BUS
 BLOWS STANDARD
 VIDEO PERFORMANCE AWAY!**



NEW!

YOU GET MORE AT ACMA!

45-Day Money-Back Guarantee ~ One Year Warranty** ~ One-Year On-Site Service ~ Lifetime Toll-Free Support ~ 24-Hour BBS ~ Certified Microsoft Compatible ~ Network Solutions ~ Staff of Certified Novell Engineers ~ Leasing.

CALL TOLL-FREE 800-786-6888

GSA (800) 578-1888, Corporate (510) 623-1212, (510) 623-0818 Fax
 Open 6am - 7pm M-F & 8am - 4pm Sat. (PST)



COMPUTERS, INC. **Acma** TM



Expo Tech Com

**NEW
245Mb 12ms
Hard Drive**

486 

A New Level of Value!



When one of the largest computer manufacturers in the world with over \$700 million in sales and 5000 employees wanted to bring out a new computer line, we asked thousands of business users, home professionals, engineers, and novices what they wanted in a computer. We were told "the most power, the highest resolution monitor, the largest hard drive, complete software, an in house service department, security

from viruses- all at the lowest price!" This was a tall order. But, after extensive research and testing, we finally met the challenge. Thus, the EXPO Tech computer was born. With everything from high resolution monitors to a built-in modem for remote diagnostics, EXPO Tech computers are the new definition of computer excellence. Furthermore, we have dedicated over 100 people to help you get the most from your computer.

At EXPO Tech, we are dedicated to providing our customers with a new level of quality...

RESEARCH AND DEVELOPMENT

Most computer companies buy different parts from many different manufacturers and then assemble their computers. At EXPO Tech computers we have our own research and development laboratories and manufacture the motherboards ourselves. Thus, you can be assured of consistent superior quality, compatibility, and always being on the leading edge of computer power and value. While most companies are introducing yesterday's technology, at EXPO Tech computers we will always give you Tomorrow's technology TODAY.



REMOTE DIAGNOSTICS



As computers and software change we at EXPO Tech computers realize our customers will need help with their future system configurations. Every EXPO Tech computer is equipped with a modem and special software that will let us access your computer,

diagnose the hardware problem, and tell you how to solve the situation. All from the comfort of your own telephone!! Plus, we have a staff of certified technicians ready to talk you through your situation, and a 24 hr tele-tech service to help you every hour of the day or night. Furthermore, you can download drivers and other helpful software from our bulletin board service. At EXPO Tech computers, we want you to be secure and problem free today and tomorrow.

EXHAUSTIVE PRODUCT TESTING All EXPO Tech components are tested for 24 hrs before they are assembled and then the completed EXPO Tech computer is burned-in again before shipping. We are so sure you will love your EXPO Tech computer that we will give you a full 30 day money back guarantee.



The EXPO Tech 486sx/33

- Desktop Metal Case, 33 Mhz
- 1 Mb super VGA Video Board w/Windows Accelerator and displays 16.7 Million colors
- 1.2 Meg Floppy, 1.44 Meg Floppy
- 102 Key Keyboard
- 14" Super VGA Non Interlaced Monitor
- Multi I/O (2 Serial, 1 Parallel, 1 Game Port)
- MS-DOS 5.0, Windows 3.1, Hi-Res Mouse
- Microsoft Works for Windows Software
- Central Point Anti-Virus Software
- 2400 Baud Modem w/Send Fax
- 4 Mb RAM, 245 Meg Seagate Hard Drive

33Mhz \$1399

Redefining Value

486dx2/50 Mhz

Same Configuration as above
Plus 128 K Cache

Just \$1999

puters



The EXPO Tech 486/33

- Desktop Metal Case, 128 K Cache, 33 Mhz
- 1 Mb super VGA Video Board w/Windows Accelerator and displays 16.7 Million colors
- 1.2 Meg Floppy, 1.44 Meg Floppy
- 102 Key Keyboard
- 14" Super VGA Non Interlaced Monitor
- Multi I/O (2 Serial, 1 Parallel, 1 Game Port)
- MS-DOS 5.0, Windows 3.1, Hi-Res Mouse
- Microsoft Works for Windows Software
- Central Point Anti-Virus Software
- 2400 Baud Modem w/Send Fax
- 4 Mb RAM, 245 Meg Seagate Hard Drive

Just \$1699

on the Desktop!

486dx2/66 Mhz

Same Configuration as above
Plus Full Tower Case

Just \$2299

*Tower Optional

A New Level of Service and Support!

● 24 HOUR TECH SUPPORT

Toll Free Technical Support Available 24 Hrs a day 7 days a week.

● REMOTE DIAGNOSTICS

On- Site Modem Diagnostics .

● ANTI-VIRUS SOFTWARE

Central Point Anti-Virus Software included.

● SAME DAY SHIPPING

Base System models in stock ordered before 11am CST, Can be shipped same day after Credit approval.

● ONE YEAR ON-SITE SERVICE

Have your computer repaired at your site.

● NEXT DAY PARTS REPLACEMENT

Replacement parts sent 24 Hour Express.

● 30 DAY NO RISK GUARANTEE

Full refund if you are not satisfied in the first 30 days after shipment.

● BUILT-IN 2400 BAUD MODEM

Free Modem and software with every EXPO Tech Computer.

● FREE MICROSOFT WORKS

Wordprocessor, Spreadsheet, Database, Graphics for Windows.

● BULLETIN BOARD SERVICE

Download Drivers and talk to techs on line.

● NO SURCHARGE ON CREDIT CARDS

We accept Visa and Mastercard.

● LEASING AVAILABLE

Leasing available to qualified buyers.

● PURCHASE ORDERS ACCEPTED

COD and terms for qualified customers.

● OPEN 7 DAYS A WEEK

8am-8pm M-F, 10am-6pm Sat. 11am-3pm Sun.
All Times are Central Standard Times.

1-800-284-EXPO



**Expo
Tech**



113 McHenry Rd. Buffalo Grove, IL 60089
Phone (800) 284-3976 • Fax (800) 947-3976

Software, Modem, & Service Package for Desktop & Tower Systems Only. All Prices, Availability and Specifications subject to change without notice. Please call to confirm Pricing, IL Sales Tax, Availability, and Warranty Details. The Intel Inside Logo is a trademark of Intel Corporation.

WE HAVE THE EDGE.



LIGHTNING VIDEO PERFORMANCE

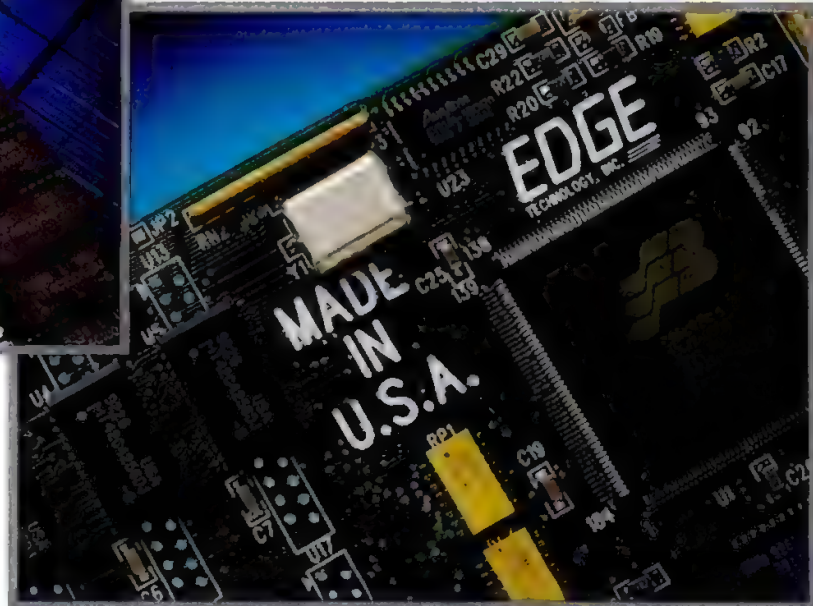
Using 2nd generation GUI Accelerators like S3's new 86C924 combined with AT&T's 24-Bit True-Color RAMDAC and 1MB of VRAM, our engineers have developed the V24 BitBlaster™, providing 16.7 million simultaneous colors with significant performance improvements over earlier S3 based designs.

Upgrade your existing PC for only \$199

MEMORY TECHNOLOGY INNOVATION

With over 10 years experience in the semiconductor industry our sister company continues to set new standards for memory technology. Their state of the art design, wafer fabrication, assembly and test facilities allow us to design and manufacture our systems from the bare silicon up. Employing over 4000 people, of which 650 are engineers, this 1 million square foot facility produces DRAMs, VRAMs and more Fast SRAMs than any other company in the world.

Edge has applied these years of semiconductor and component manufacturing experience to develop the ultimate line of computers. Feature for feature the competition simply doesn't compare.



Ultima Local Bus ValueLine

486SX•33 LOCAL BUS

- Intel 486SX 33MHz Processor
- Intel Overdrive Upgrade Socket
- 256K 17ns Static RAM Cache
- 8MB of High Speed RAM
- 213MB 15ms IDE Hard Drive
- 1.44MB and 1.2MB Floppy Drives
- D24 BitBlaster™ GUI Accelerator
- 24 Bit True-Color w/ 1MB RAM, 16.7M Simultaneous Colors, Up to 1280 x 768 Resolution
- Non-Interlaced 14" Super VGA Color Monitor, .28mm Dot Pitch 1024 x 768 Resolution, VESA
- Logitech Mouse and Mouse Pad
- 1 Parallel, 1 Game, 2 Serial Ports
- 101-Key Keyboard (130-Key Opt.)
- Microsoft DOS 5.0 Factory Installed

\$1799

486DX•33

\$1999

486DX2•50

\$2199

486DX2•66

\$2499

486DX2•66

\$2699

486SX•25 LOCAL BUS

- Intel 486SX 25MHz Processor
- Intel Overdrive Upgrade Socket
- 4MB of High Speed RAM
- 120MB 15ms IDE Hard Drive
- 1.44MB 3.5" Floppy Drive
- D24 BitBlaster™ GUI Accelerator
- 24 Bit True-Color w/ 1MB RAM, 16.7M Simultaneous Colors, Up to 1280 x 1024 Resolution
- 14" Super VGA Color Monitor 1024 x 768 Resolution
- Logitech Mouse and Mouse Pad
- 1 Parallel, 1 Game, 2 Serial Ports
- 101 Key Keyboard (130-Key Opt.)
- Microsoft DOS 5.0 Factory Installed

\$1199

486SX•33

\$1299

486DX•33

\$1499

UPGRADES

8MB Upgrade \$99
Upgrade from 4MB to 8MB

V24 BitBlaster™ \$99
S3 86C924 GUI Accelerator,
16.7M Simultaneous Colors,
Non-Interlaced at 1280 x 1024

FAX /Modem 9624 \$49
Send & Receive w/MNP5
and QuickLink II

Teac Dual Floppy \$39
1 44MB 3.5" and 1 2MB 5.25"

15" Monitor Upgrade \$149
Upgrade from 14" Non-Interlaced
Monitor to MAG 15" Color Monitor,
Non-Interlaced at 1280 x 1024

17" Monitor Upgrade \$799
Upgrade from 14" Non-Interlaced
Monitor to MAG 17" Color Monitor,
Non-Interlaced at 1280 x 1024

Upgrades available at time
of system purchase only.

**CALL FOR CUSTOM
NETWORK SERVER
CONFIGURATIONS**

A man in a white lab coat and safety glasses holds a glowing orb against a sunset background. The image is framed by a dark border, and a small inset in the bottom right corner shows a building with the letters 'FD' and 'CH' visible.

In addition to our Ultra-Fast 17ns SRAMs and high performance board level products, we use award winning brand name components like genuine Intel processors, MAG Innvision monitors, Maxtor hard drives and Logitech mice. Edge provides you with the highest price / performance value available without sacrificing the service and support you deserve.



- Intel 486DXL 25MHz Processor
- 8K Cache and Math CoProcessor
- 4MB of High Speed RAM (to 16MB)
- 80MB Removable Hard Drive
- Color VGA Display 640 x 480
- Dimensions: 9.4" x 12.2 x 2"
- Weight: 7.1 lbs with Battery
- Suspend / Resume Feature
- Full Size 86-Key / Keyboard
- 1.44MB 3.5" Floppy Drive
- Advanced Power Management
- 1 Parallel, 1 VGA, 2 Serial Ports
- A/C Charger / Adapter
- Carrying Case Included
- Microsoft DOS 5.0 Factory Installed

\$2999

120MB Hard Drive	\$199
8MB Upgrade	\$199
Upgrade from 4MB to 8MB	
Fax/Modem 9624	\$99

A vintage Apple II computer system is shown, consisting of the main computer unit, a keyboard, and a mouse. The computer unit is a light-colored, rectangular box with a screen on top displaying a colorful, abstract graphic. The keyboard is a standard Apple II keyboard with a numeric keypad. The mouse is a small, light-colored device with two buttons. The entire system is placed on a wooden surface.

800-438-3343

- SAME DAY SHIPPING ON MOST SYSTEMS
- 30 DAY RISK-FREE MONEY BACK GUARANTEE
- ONE YEAR EXPRESS PARTS REPLACEMENT
- LIFETIME TOLL-FREE TECHNICAL SUPPORT
- ONE YEAR ON-SITE SERVICE OR SYSTEM REPLACEMENT

ON-SITE SERVICE

EDGE
TECHNOLOGY, INC.

**MON-FRI 7AM - 7PM,
SAT 8AM - 2PM(MST)**

915 E. Karcher Road - Nampa, Idaho 83687
(208) 465-3434 - FAX (208) 465-3424

[illegible]

CIRCLE 119 ON READER SERVICE CARD

POWER TOOL

Tri-Star DX² VL-Station

50MHz
\$3495

Lease \$125/Month



66MHz
\$3695

Lease \$132/Month

WHETHER YOU WORK IN WINDOWS, CAD OR DTP YOUR PRODUCTIVITY IS DEPENDENT ON THE QUALITY OF YOUR TOOLS. TRI-STAR'S VL STATIONS OFFER YOU WORLD CLASS PERFORMANCE WITH THE POWER TO BE YOUR BEST.

A D V A N C E D F E A T U R E S

VESA VL-Bus compliant system board equipped with two 32-bit VL-Bus slots and 6 ISA slots including Intel 486 DX-2 Processor, 8MB RAM, Intel Overdrive Socket and Flash EPROM BIOS.

VL-Bus 32-bit Graphics Accelerator with 2MB of Dual Ported VRAM and fast 110MHz RAM DAC supports 800 x 600 with 16.7M colors, 1024 x 768 with 65,000 colors and 1280 x 1024 with 256 colors, all Non-interlaced.

17" MPR II compliant Flat Square Screen Color Display supporting up to 1280 x 1024 Resolution Non-interlaced.

VESA VL-Bus compliant integrated 32-bit IDE Controller supports up to two 525 MB 12ms IDE Hard Drives.

Tri-Star Classic Deskside Chassis with Dual Cooling Fans, Maxtor 210MB IDE Hard Drive, Teac 1.2MB and 1.44MB Floppy Drives, Microsoft Windows 3.1 and DOS 5.0, Two Serial Ports and One Parallel Port, Focus 101 Key Tactile Keyboard

SCSI II/CD-ROM Upgrade

A Tri-Star exclusive—includes VL-Bus SCSI II Bus Master Host supporting up to seven SCSI Devices, SCSI II Hard Drive upgrade, and a fast 265ms 600MB SCSI CD-ROM. Add Only \$655.



TRI-STAR
COMPUTER CORPORATION
1 800 755 1000

120 South Weber Drive, Chandler, Arizona 85226

(602) 961-3401 Fax (602) 961-4010

CIRCLE 121 ON READER SERVICE CARD

wait for a dial tone before dialing. ATX0 tells the modem not to use the tones at all—which is useful for preventing the modem from waiting for a dial tone when you've already dialed the number manually.

ATD, as its final task, causes the modem to send the originate tones (which is just like using the familiar ATA to put answer tones on the line).

Frederick S. Holmes
Annandale, Virginia

► **PC MAGAZINE:** This letter is typical of several we received from readers. ATX0D combines AT, X0, and XD, yielding a command that tells the modem to send originate tones without worrying about the presence or absence of a dial tone. Actually, though, my main objective in the original item was to point out the fact that AT&T went to a great deal of trouble to get these data-jack-equipped pay phones out to the public—then made them hard to use!

—Frank J. Derfler, Jr.

Languages

CREATING TURBO PASCAL OBJECTS

✓ **TIP** I've often wanted to create Turbo Pascal derived objects within units where the object's type was unknown but its parent type was known. One example of this is a CardDeck unit in which the abstract CardType was known but the descendants WindowCards, GraphicCards, and TextCards were not. Since the CardDeck unit needed to instantiate some multiple of 52 cards, I didn't consider instantiation outside of the CardDeck unit. To solve the problem, I developed NewObjByType (Figure 3), which implements a technique similar to the LOAD constructors in Turbo Pascal streams.

Only one function, NewByType, is exported by the NewObjByType unit. This function's arguments are the following:

- VMT—a pointer to the object's virtual

memory table (for example, TypeOf(MyObjectType));

- ConsAddr—the address of a constructor for the object (@MyObjectType.Constructor); and
- an untyped VAR parameter that allows object-specific initialization data to be passed to the newly created object.

Internally, the unit contains an assembly language function that is coded both as a symbolic assembler (for Turbo Pascal 6.0 and Turbo Pascal for Windows) and as an in-line assembler (for Turbo Pascal 5.5). This code pushes the address of the object-specific data, the VMT offset, and a nil "Self" parameter on the stack. It then calls the constructor indirectly. Finally, it moves the constructor's return value from the stack frame into AX, DX, and returns. The code fragments in Figure 4 illustrate the use of NewObjByType.

NewObjByType has a few limitations, chief among them is that the object must have a VMT. This means it must have at least one virtual method. Objects de-

NEWOBJBY.PAS

Complete Listing

```
UNIT NewObjByType;
($DEFINE ObjectProfessional)

{$IFDEF WINDOWS}
  {$IFDEF VER60}
    {$IFDEF VER55}
      CRASH! This unit requires Turbo Pascal
        Version 5.5 or 6.0 or Windows
    {$ENDIF}
  {$ENDIF}
{$ELSE}
  {$IFDEF VER10}
    !! This unit requires Turbo Pascal Windows Version 1.0
  {$ENDIF}
{$ENDIF}

{$IFDEF VER60}
  {$DEFINE SYMBOLIC_ASM}
{$ENDIF}
{$IFDEF WINDOWS}
  {$DEFINE SYMBOLIC_ASM}
{$ENDIF}

(**) INTERFACE (**)

USES
  {$IFDEF WINDOWS}
    WObjects; { Needed to get definition of object type TObject }
  {$ENDIF}
  {$IFDEF VER55}
    OProot; { Needed to get definition of object type Root }
  {$ENDIF}
  {$DEFINE ROOT}
{$ENDIF}
  {$IFDEF VER60}
    {$IFDEF ObjectProfessional}
      OProot; { Needed to get definition of object type Root }
    {$ENDIF}
    {$ELSE}
      OObjects; { Needed to get definition of object type TObject }
    {$ENDIF}
  {$ENDIF}

FUNCTION NewByType(VMT : Pointer; { Returned by TypeOf }
                  ConsAddr : Pointer; { @MyConstructor }
                  VAR Data) { Data for constructor }

{$IFDEF ROOT}
  : RootPtr; { Returns new obj. pointer }
{$ELSE}
  : TObject; { Returns new obj. pointer }
{$ENDIF}

(**) IMPLEMENTATION (**)

FUNCTION pNewByType(VMTOfs : Word; { Only the VMT's DS offset})
                  ConsAddr : Pointer; { Pass through parameter }
                  VAR Data) { Pass through parameter }

{$IFDEF ROOT}
  : RootPtr; { Returns new obj. pointer }
{$ELSE}
  : TObject; { Returns new obj. pointer }
{$ENDIF}

{$IFDEF}
  BEGIN
    {$IFDEF SYMBOLIC_ASM}
      ASM
        Push word [Data+2] { Push address of untyped }
        Push word [Data] { var parameter Data }
        Push VMTOfs { Push value of VMT offset in DS }
        Xor AX,AX { Get ready for a nil 'Self' }
        Push AX { parameter so constructor will }
        Push AX { allocate a new instance }
        Call [ConsAddr] { call the constructor }
        Mov word [BP-4],AX { transfer the function return }
        Mov word [BP-2],DX { to place Turbo expects it. }
      END;
    {$ELSE}
      INLINE
        $FF/$76/<Data+2/ { Push word [Data+2] }
        $FF/$76/<Data/ { Push word [Data] }
        $FF/$76/<VMTOfs/ { Push VMTOfs }
        $31/$C8/ { Xor AX,AX }
        $50/ { Push AX }
        $50/ { Push AX }
        $FF/$5E/<ConsAddr/ { Call [ConsAddr] }
        $89/$46/$7C/ { Mov word [BP-4],AX }
        $89/$56/$7E/ { Mov word [BP-2],DX }
      {$ENDIF}
    {$ENDIF}
  END; { pNewByType }

FUNCTION NewByType(VMT : Pointer; { Returned by TypeOf }
                  ConsAddr : Pointer; { @MyConstructor }
                  VAR Data) { Data for constructor }

{$IFDEF ROOT}
  : RootPtr; { Returns new obj. pointer }
{$ELSE}
  : TObject; { Returns new obj. pointer }
{$ENDIF}

TYPE
  PointerRecord = RECORD
    Offset,
    Segment : Word;
  END; { PointerRecord }
BEGIN
  NewByType := pNewByType(PointerRecord(VMT).Offset,
                        ConsAddr,
                        Data);
END; { NewByType }
END. { NewObjByType }
```

Figure 3: The NewObjByType function lets you initialize an object using only its VMT, the address of its constructor, and any ancestor of that object.





ARRESTING

\$1299

33MHz 386SX

- 1.5 times faster than standard VGA
- high-speed cache

HYUNDAI

HYUNDAI



Do something 33MHz.

Hyundai's 386SX-33 is packed with so much New Breed power, you can't even call it an entry-level system. It's more like a high-throughput powerhouse that breaks all price/performance records in its class. We're talking an unbelievable Landmark System Speed Test of 44.56MHz—faster than Compaq, Dell, and AST systems in the same class. And at this price, it's a steal!

In fact, it's got so much speed and power, you can use it as a stand-alone system, or as a workstation running on a network.

Hyundai 333SP

- 33MHz 386SX CPU
- 16KB ultra-fast cache, (expandable to 64KB)
- SVGA Graphics on motherboard w/1.5 Winmarks performance @ 1024 x 768 resolution
- 2MB high-speed RAM, (16MB max)
- 85MB 17ms IDE HDD, 32KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs, (2.88MB-ready FDD interface)
- 4 external drive bays
- 5 ISA slots, (3 full-length, 2 half-length)
- 14" ultra-high resolution, color display w/1024 x 768 resolution, .28 dot pitch, tilt-and-swivel base
- 25/1P, PS/2 mouse ports
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and Windows 3.1

Hyundai's 333SP features a U.S.-designed and -built motherboard with our super-fast, 16KB write-back cache that's expandable to 64KB. That means the CPU doesn't have to wait for data and runs at zero-wait states. Also integrated on the motherboard is our super VGA with 1.5 times the performance of standard VGA. The result: blazing graphics!

Hyundai's 333SP runs anything you want, from Windows applications, database tools, and spreadsheets, to graphics and word processing software. And it's loaded with all the RAM and disk storage you need for big-time personal productivity. Do something that's arresting. Call Hyundai at 1-800-933-3445.

Do something 40MHz

Hyundai's 340S is one of the first 40MHz 386SX computers on the market. And at this price, you'll want to steal this one, too!



\$1549

Hyundai 340S

- 40MHz 386SX CPU
- 16KB ultra-fast cache, (expandable to 64KB)
- SVGA Graphics w/512KB RAM and 1024 x 768 resolution
- 4MB high-speed RAM, (16MB max)
- 85MB 17ms IDE HDD, 32KB disk buffer
- 1.44MB 3-1/2" and 1.2MB 5-1/4" FDDs (2.88MB-ready FDD interface)
- 5 external drive bays, 2 internal
- 7 ISA slots
- 14" non-interlaced, ultra-high resolution, flicker-free, color display w/1024 x 768 resolution, .28 dot pitch, 72Hz refresh rate, tilt-and-swivel base
- 25/1P, PS/2 mouse ports
- 200 watt power supply
- 101 keyboard, 2-button mouse
- Built-in virus protection, front key lock, 2 level password
- MS DOS 5.0 and Windows 3.1

**Call Hyundai Direct at
1-800-933-3445**

Hours: 6AM-5PM PST M-F
PCM 115

**For the dealer nearest you
call 1-800-288-4986**

HYUNDAI
PCs DESIGNED AND BUILT IN AMERICA

166 Baypointe Pkwy, San Jose, CA 95134

We accept MasterCard, Visa, money orders, certified checks (allow 10 days for processing), CODs, approved company and institutional purchase orders, and wire transfers. All return items must be accompanied by a return merchandise authorization (RMA) number. Opened, defect-free software is non-refundable. Prices and product descriptions are subject to change without notice. Hyundai is not liable for damage due to omissions or typographical errors. All trademarks are the property of their respective companies. The Do Something logo is a trademark of Hyundai. © 1992 Hyundai Electronics America. All rights reserved.

CIRCLE 275 ON READER SERVICE CARD

Powerstrokes:



Morning practice for the Head of the Charles Regatta, Boston

**ARIEL DESIGN
KEEPS SETTING
THE PACE.
NOW WITH VESA
LOCAL BUS.**



**PC Magazine
Editor's Choice
Ariel 486SX-25
\$2290.00
October 13, 1992**

EISA Cache

Ariel's systems deliver performance. "A scorching performer" is the way PC Sources described our 486DX-50 EISA system in a May review. The boost from external 256k cache and AMI's caching controller, provides you with the disk intensive workstation that you demand.

486SX-25 ISA Bus
256k Cache, 4 Meg RAM
1.2 and 1.44 Teac FDD
245 Quantum HDD
Diamond 24X Video
6 Bay Tower 250 Watt PS
ViewSonic 6 Ni 14" Color
Now with Borland Software

VESA Local Bus

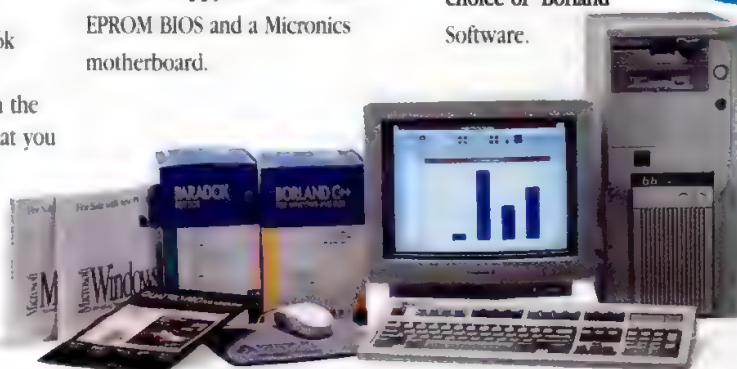
Ariel's VLB systems use the VESA standard local bus to run applications with unprecedented speed. Using ATI UltraPro VL-Bus graphics adapter - with a Winmark of 29 million - and a hard disk controller, your system's performance improves up to 300%. All VLB systems include state-of-the-art technology with features like 2-VL-Bus slots; 2 integrated VL-Bus IDE Controllers; BIOS support for 2.88 Floppy Disk Drives; Flash EPROM BIOS and a Micronics motherboard.

Customization

Ariel's technical staff provides the support you need when you customize with hard drives, tape drives and other power hungry peripherals. We offer monitor upgrades from NEC, including the NEC 5FGX; NEC CD ROMs, and up to 2.1 gigabyte hard drives from Maxtor, Fujitsu and Micropolis.

Software Options

- IBM OS/2 2.0 or
- MS Windows 3.1 & choice of Borland Software.



WINDOWS POWER STATIONS WITH BORLAND SOFTWARE

**486SX-25VLB \$2095
486DX-33VLB \$2495
486DX2-66VLB \$2895**

Intel 486SX-25 CPU, 486DX-33 CPU or 486DX2-66 CPU
Micronics Motherboard
256k Cache on 486DX2-50
6 Bay Tower Case, 250 Watt PS
4 Meg 70ns RAM
1.2 or 1.44 Teac FDD
213 Mb Maxtor IDE Hard Drive
2-S Ports, 1-P Port
Two 32-Bit VESA Local Bus Slots
Volante S3-805 VL-Bus Video Card
ViewSonic 6 Ni Color 14" VGA
MSDOS 5.0/Windows 3.1/MS Mouse
Keytronics 101 Keyboard
Choice of Borland Application Software

**486DX-33VLB \$3595
486DX2-50VLB \$3695
486DX2-66VLB \$3995**

Intel 486DX-33 CPU, 486DX2-50 CPU or 486DX2-66 CPU
Micronics Motherboard 256k Cache
6 Bay Tower Case; 250 Watt PS
4 Meg 70ns RAM
1.2 and 1.44 MB Teac FDD
520Mb Fujitsu SCSI Hard Drive
UltraStor 34F VLB SCSI Controller
2-S Ports, 1-P Port
Two 32-Bit VESA Local Bus Slots
ATI UltraPro VL-Bus Video Card with 1 Mb VRAM 72 Hz refresh
ViewSonic 6 Ni 14" Color VGA
MSDOS 5.0/Windows 3.1/MS Mouse
Keytronics 101 Key Keyboard
Choice of Borland Application Software

**486DX-50EISA \$4395
486DX2-66EISA \$4595**

Intel 486DX-50 CPU or 486DX2-66 CPU
Micronics Motherboard, 256k Cache
8 Bay Tower Case, 300 Watt PS
4 Meg 70ns RAM
1.2 and 1.44 MB Teac FDD
520 Mb Fujitsu SCSI Hard Drive
2-S Ports, 1-P Port
AMI EISA/SCSI Controller,
386SX-16/1 Mb
Diamond SpeedStar 24X
ViewSonic 6 Ni 14" Color VGA
MS DOS 5.0/Windows/3.1 MS Mouse
Keytronics 101 Keyboard
Choice of Borland Application Software

OS/2 WORKSTATION

**486DX-33VLB \$4095
486DX2-50VLB \$4195
486DX2-66VLB \$4495**

Intel 486DX-33 CPU, 486DX2-50 CPU or 486DX2-66 CPU
Micronics Motherboard, 256k Cache
8 Bay Tower Case, 300 Watt PS
8 Meg 70ns RAM
1.2 and 1.44 MB Teac FDD
877Mb Toshiba SCSI Hard Drive
UltraStor 34F VLB SCSI Controller
2-S Ports, 1-P Port
ATI UltraPro VL-Bus Video 1 Mb VRAM
ViewSonic 6 Ni 14" Color VGA
MS DOS 5.0/MS Mouse
Keytronics 101 Keyboard
IBM OS/2

CIRCLE 209 ON READER SERVICE CARD



Ariel Design, Inc.
COMPUTER SOLUTIONS

145 Webster St. Hanover MA 02339

1-800-952-7435

Monday - Friday 9:00 a.m. - 8:00 p.m. EDT Sat. 11-5 p.m.



617/982-8800

FAX: 617/982-9095



**Lifetime Toll Free Technical Support.
30-Day Money Back Guarantee.
One Year Warranty.
Express Parts Replacement.
Optional On Site Service.
Bulletin Board System.
Leasing Options Available.**

No surcharge for VISA, Mastercard or Discover. Prices and specifications are subject to change without notice. Prices do not include shipping. IBM and OS/2 are registered trademarks of the International Business Machine Corp. Other brands and product names are trademarks or registered trademarks of their companies.



Change your definition of fully loaded. Starting Now.

You won't find "fully loaded" in your Webster's, because we've redefined the meaning of the word. Now every O-C-T System includes Intel Inside, Intel Outside,* and the entire O-C-T Value Commitment Package.

We've redefined value too, by offering more performance for your dollar. And becoming the fastest growing p.c. company in the world. Which boggles the mind when O-C-T Systems intended to simply redefine the meaning of common sense.



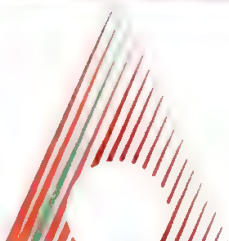
Common sense performance
without price.

1-800-829-8386



The Intel Inside® logo is a trademark of Intel Corporation.

*Affiliated with the Intel/Prime Service Network.



**O-C-T
Systems**

Olympic Computer Technology, Inc.
Northward Business Park
6830 South 193rd Street
Kent, WA 98032

Hours 7:30 am - 6 pm Mon.-Fri.,
7:30 am - 5 pm Sat., PST
TEL (206) 872-5800
FAX (206) 872-8114

LOCATIONS: Seattle • London • Paris

O-C-T VALUE COMMITMENT

- **Upgrades available? No problem! Call for pricing.**
- **30 day no-questions asked money-back guarantee.**
- **Exclusive Intel Outside* on-site maintenance option... just \$50!**
- **6-day a week toll free customer service and technical support hotline.**
- **One year factory warranty on parts and lifetime service.**
- **Major credit cards, corporate purchase orders, C.O.D.'s welcome.**

O-C-T HOME & BUSINESS SOLUTIONS

386-25SX

- Intel® 80386-25SX running at 25 Mhz
- 2MB-70NS RAM
- 5-Bay Mini-Tower Case
- Two Serial/One Parallel Ports
- 80MB-17MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios. M.S. DOS 5.0

\$899

386-330X

- Intel® 80386-33DX running at 33 Mhz
- 64K Cache on Board
- 4MB-70NS Ram Expandable to 32MB on Board
- Mid-size Tower Case
- Two Serial/One Parallel Ports
- 120MB-17MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios. M.S. DOS 5.0
- Windows 3.1, Microsoft Mouse.

\$1,189

486-25SX

- Intel® 80486-33DX running at 33 Mhz
- 64K Cache on Board
- 4MB-70NS Ram Expandable to 32MB on Board
- Mid-Tower Case
- Two Serial/One Parallel Ports
- 120MB-17MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios. M.S. DOS 5.0

\$1,329

Prices and configurations are subject to change without notice.

O-C-T HIGH PERFORMANCE

486-500X ISA

- Intel® 80486-500X running at 50 Mhz
- 64K Cache on Board
- 8MB-70NS Ram Expandable to 32MB On Board
- Eight 16-Bit Expansion Slots/Five free slots
- 6 Bay Full-Sized Tower Case
- Two Serial/One Parallel Ports
- 200MB-15MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios
- M.S. DOS 5.0
- Windows 3.1
- Microsoft Mouse

\$2,099

O-C-T WINDOWS SUPER STATION

486-330X BABY

- Intel® 80486-33DX running at 33 Mhz
- 64K Cache on Board
- 4MB-70NS Ram Expandable to 32MB on Board
- 5 Bay Mini-Tower Case
- Two Serial/One Parallel Ports
- 120MB-17MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios. M.S. DOS 5.0
- Windows 3.1, Microsoft Mouse

\$1,549

O-C-T WORKHORSE

486-330X

- Intel® 80486-33DX running at 33 Mhz
- 256K Cache on Board
- 4MB-70NS Ram Expandable to 32MB on Board
- 6 Bay Full-Sized Tower Case
- Two Serial/One Parallel Ports
- 200MB-15MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios
- M.S. DOS 5.0
- Windows 3.1
- Microsoft Mouse

\$1,769

O-C-T SUPER CAD

486-500X EISA

- Intel® 80486-500X running at 50 Mhz
- 32 Bit Extended Industry Standard
- 256K Cache on Board
- 8MB-70NS Ram Expandable to 32MB on Board
- Eight 32-Bit Expansion Slots/Five free slots
- 6 Bay Full-Sized Tower Case
- Two Serial/One Parallel Ports
- 200MB-15MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios
- M.S. DOS 5.0
- Windows 3.1
- Microsoft Mouse

\$2,399

486-660X2

- Intel® 80486-660X2 running at 66 Mhz
- 256K Cache on Board
- 8MB-70NS Ram Expandable to 32MB on Board
- 8 Bay Full-Sized Tower Case
- Two Serial/One Parallel Ports
- 340MB-15MS Hard Drive
- 1.44MB-3.5 inch Floppy Drive
- 1.2MB-5.25 inch Floppy Drive
- 101 Keytronics® Keyboard
- SVGA 14" .28 Dot Pitch Color Monitor
- 16 Bit SVGA Card 1MB
- AMI Bios
- M.S. DOS 5.0

\$2,649

Let Mitac Put

NOVELL-CERTIFIED 486-66 EISA

The Perfect Server

FEATURES

- ◆ Built-In Co-Processor
- ◆ Shared Memory
- ◆ 256K Of Writeback Cache
- ◆ Open System Architecture
- ◆ Multi-Layered Security System
- ◆ Power to Spare

SPECIFICATIONS

- ◆ Intel™ 486DX2-66MHz Processor
- ◆ 8MB 70ns RAM
- ◆ TEAC 1.2MB or 1.44MB Floppy Drive
- ◆ Conner 540MB SCSI Drive
- ◆ EISA SCSI Controller
- ◆ Integrated VGA
- ◆ MS-DOS 5.0, Windows 3.1, Mouse
- ◆ 101 Enhanced Keyboard
- ◆ 14" Mono VGA Monitor
- ◆ 2 Serial & 1 Parallel Port

\$3975

33MHz Model Also Available



**NetWare
Integrated**

**The
Only Red
You'll Ever
See!**



Put Out Your Networking Fires!

TIRED OF NETWORK FIREFIGHTING?

Most people think that putting out fires is *de rigueur* when doing networks. Well, at Mitac Networks Direct (formerly AGATech), we make sure that it doesn't have to be that way. That's why, in addition to building all of our ready-to-use networks with the best components and peripherals available, we've put together our comprehensive *Mitac Network-Ready Program*. A revolutionary concept in customer support that assists you from the moment you call about your new Mitac network.

The Mitac Network-Ready Program

- ◆ CUSTOM NETWORK CONFIGURATION
- ◆ NOVELL-CERTIFIED ENGINEERS & SYSTEMS
- ◆ FULL LINE OF NETWORK CABLING & PERIPHERALS
- ◆ EXPERT INSTALLATION
- ◆ SUPERIOR HANDS-ON NETWORK TRAINING
LANs, UNIX, TCP/IP, NFS, WAN & NETWORK MGMT
- ◆ LIFETIME TOLL-FREE TECHNICAL SUPPORT
- ◆ 1-YEAR PARTS & LABOR WARRANTY
- ◆ 30-DAY NO-RISK MONEY BACK GUARANTEE
- ◆ ON-SITE DOW JONES SERVICE

NETWORKS YOU CAN COUNT ON!

With over a \$1/2-billion in annual sales, complete systems solutions sold in over 50 countries worldwide and a dedicated work force of over 1,100 employees, Mitac provides you with technological excellence that ensures that you're getting the best. We give you the latest high-performance systems, fully-tested and custom-configured for today's needs and tomorrow's challenges, and sell direct to you at the best prices possible. It's simple. At Mitac, you won't get hosed.



TRUE INVESTMENT PROTECTION!

QUALITY MANUFACTURING

All of our American-made systems are designed and built according to rigid quality control standards, assuring that you get consistent and unparalleled performance.

QUALITY COMPONENTS & PERIPHERALS

Only the finest components available qualify to become integral parts of your Mitac system or network. Recognized leaders like 3-Com, Conner, Diamond, Intel, Maxtor, Microdyne, Micropolis, Motorola Altair, Novell, SCO, SynOptics, TEAC, US Robotics and Xircom are just some of the members of the growing Mitac Network team.

CUTTING EDGE TECHNOLOGY

Our engineers go out of their way to keep Mitac systems and networks on the cutting edge of technology. You can bet that if there is a new, proven advancement in computing or network communication technology, Mitac will deliver it!

CORPORATE & GOVERNMENT ACCOUNTS WELCOME

Our systems and network consultants and engineers work with you to provide you with your best possible solution. We welcome corporate purchase orders and all types of government purchase contracts.

ALL '93 486DX MODELS FEATURE NEW VESA LOCAL BUS ARCHITECTURE!



BALLISTIC DESKTOP

- Intel 486DX2-66MHz Processor
- 8MB RAM - Expandable to 128MB
- 128K Cache - Expandable to 256K
- TEAC 1.2MB & 1.44MB Floppy Drive
- Conner 540MB 12ms Hard Drive
- IDE Controller with I/O
- Diamond VESA 1MB 24-Bit SVGA
- MS-DOS 5.0, Windows 3.1, Mouse
- 101 Enhanced Keyboard
- 15" Flat Screen SVGA .28 DP Monitor

\$3195



LAN MASTER 500

- Intel 486DX-50MHz Processor
- 8MB RAM - Expandable to 128MB
- 128K Cache - Expandable to 256K
- TEAC 1.2MB & 1.44MB Floppy Drive
- Conner 340MB 12ms Hard Drive
- IDE Controller with I/O
- Diamond VESA 1MB 24-Bit SVGA
- MS-DOS 5.0, Windows 3.1, Mouse
- 101 Enhanced Keyboard
- 15" Flat Screen SVGA .28 DP Monitor

\$2795



VESA STATION

- Intel 486DX-33MHz Processor
- 4MB RAM - Expandable to 128MB
- 128K Cache - Expandable to 256K
- TEAC 1.2MB & 1.44MB Floppy Drive
- Conner 170MB 16ms Hard Drive
- IDE Controller with I/O
- Diamond VESA 1MB 24-Bit SVGA
- MS-DOS 5.0, Windows 3.1, Mouse
- 101 Enhanced Keyboard
- 14" SVGA .28 Non-Interlaced Monitor

\$1895



THE BOTTOM LINE

- Intel 486SX-25MHz Processor
- 4MB RAM - 8K Cache
- TEAC 1.2MB Floppy Drive & 1.44MB Floppy Drive
- Conner 120MB Hard Drive
- IDE Controller with I/O
- 1MB Super VGA
- MS-DOS 5.0, Windows 3.1, Mouse
- 101 Enhanced Keyboard
- 14" SVGA .28 Non-Interlaced Monitor

\$1295

GET THE SAFETY OF MITAC TODAY!

1-800-568-6972

MiTAC 
AGATECH NETWORKS DIRECT



48571 MILMONT DRIVE, BLDG B, FREMONT, CA 94538
 MON-FRI 6AM-6:30PM • SAT 8AM-4PM PACIFIC TIME



The Intel Inside Logo is a trademark of Intel Corporation. All other trademarks are owned by their respective companies.
 © COPYRIGHT 1993 American Mitac Corporation. All prices subject to change without notice.

CIRCLE 112 ON READER SERVICE CARD

SOME SUPPORT PEOPLE HAVE ALL THE ANSWERS.



THE LATEST TECHNICAL SUPPORT.

Support on Site™ for Applications is the most comprehensive and complete source of technical support information anywhere. It covers all the leading PC software applications and operating environments. It's on a single CD-ROM. And it's updated every month.

FAST ANSWERS. Support on Site helps solve software problems quickly. Its key uses are: • Handling conflicts between products • Identifying the solutions to error messages • Configuring software • Obtaining the latest drivers and ancillary software • Providing information on advanced techniques.

ANSWERS ON THE DESKTOP. Support on Site works right at the support desk. It combines extensive technical and operational software information in one quick, search-and-retrieve program. When a word or phrase is typed the entire database is quickly searched. And there's an answer in seconds.

ANSWERS FROM THE PUBLISHERS. The information on Support on Site comes directly from software publishers. It's their manuals and technical notes – and much of it has never been available before. Plus there's information from Cobb Newsletters and reference books by Que and Ziff-Davis Press. Support on Site even includes proprietary software – drivers, patches, bug fixes and macros – again directly from software publishers.

SUPPORTS ALL THIS SOFTWARE. Support on Site supports all these applications and operating systems – and more are being added every month!

ALDUS CORPORATION

Aldus® PageMaker® for Windows™

BORLAND INT'L, INC.

dBase®

MultiMate®

Paradox®

Quattro® Pro

CENTRAL POINT SOFTWARE

PC Tools®

COMPUTER ASSO., INT'L

Compe®

Cricket Presents

dbFast

SuperCak

FOX SOFTWARE, INC.

FoxPro™

IBM CORPORATION

OS 2®

LOTUS DEVELOPMENT CORP.

Freelance Graphics™ for DOS™

Freelance Graphics™ for Windows™

Lotus® 1-2-3®

Lotus® 1-2-3® for Macintosh

Lotus® 1-2-3® for Windows™

Lotus® Magellan

Lotus® Symphony®

Ami Pro™

MICROSOFT CORP.

Microsoft® Excel®

Excel® for Macintosh

Microsoft® Windows™

Microsoft® Word® for DOS

Microsoft® Word® for Windows™

Word® for Macintosh

Microsoft® Works®

Microsoft® Works® for Windows™

MS-DOS

PowerPoint®

Microsoft® Project

QUARTERDECK

OFFICE SYSTEMS

QEMM™

DESQView™

SOFTWARE PUB. CORP.

Harvard Graphics™

SYMANTEC

Q&A™

SYMANTEC/PETER NORTON

COMPUTING GROUP

Norton AntiVirus for DOS

Norton AntiVirus for Windows™

Norton Backup

Norton Backup for Windows™

Norton Desktop for Windows™

Norton Utilities for the Macintosh

peAnywhere

WORDPERFECT CORP.

WordPerfect® for Windows™

WordPerfect®

WORDSTAR INTERNATIONAL, INC.

WordStar®

GET ALL THE ANSWERS FOR YOURSELF. Call today. See how Support on Site can boost support productivity, expand capabilities, control costs and answer support questions – fast.



1-800-827-7889 EXT. 332

COMPUTER
LIBRARY

CIRCLE 033 ON READER SERVICE CARD



FAST ANSWERS TO SOFTWARE QUESTIONS

HARD DRIVES

SEAGATE

Best Selling Hard Drives
AT SUPER SALE PRICES!

All SEAGATE Drives Include: Universal
Installation Manual, AT Ribs & Cable

ST 251-1 MFM	42 MB	28MS	\$239
ST 351A IDE	42MB	28MS	\$165
ST 3120A IDE	106 MB	16MS	\$249
ST 3144A IDE	130 MB	19MS	\$275
ST-3283A IDE	245MB	12MS	\$509
ST-3283N SCSI	245MB	12MS	\$555

MAXTOR

IDE 7120 7213		\$285	\$375
SCSI 7120 7213		\$329	\$469
IDE LXT 340 FREE DELIVERY		\$649	
SCSI LXT 340 FREE DELIVERY		\$679	

QUANTUM

ELS 42 IDE / SCSI		\$175	\$185
ELS 85 DE SCSI		\$229	\$269
ELS 127 DE SCSI		\$329	\$329
ELS 170 DE SCSI		\$349	\$385
LPS 240 DE SCSI		\$509	\$655
SCSI 425 ProDrive FREE DEL		\$919	

PLUS DEVELOPMENT

Hardward HX 50 105		\$219	\$379
Hardward EZ 42 85		\$199	\$279
Hardward EZ 127 240		\$339	\$549

MICROPOLIS

NEW DRIVES!

FREE DELIVERY
in the contiguous 48 states

1528 SCSI	134MB	FH	\$1749
1548 SCSI 2	174MB	FH	\$2249
1568 ESD	15MHz 678 8MB	FH	\$1299
1588 SCSI	667 8MB	FH	\$1349
1598 SCSI 2	1034 5MB	FH	\$1649
1598 Differ SCSI 2	1034 5MB	FH	\$1839
1624 SCSI 2	668MB	HH	\$1199
1664 ESD	15MHz 345MB	HH	\$979
1684 SCSI	349MB	HH	\$1059
1908 SCSI 2	1408MB	FH	\$2049
1924 SCSI 2	2100MB	FH	\$2899
2112 SCSI 2	1050MB	FH	\$1829

CONTROLLERS

ADAPTEC

1522 Kit / 1542 Kit		\$149	\$249
---------------------	--	-------	-------

FUTURE DOMAIN

1680 Dlx		\$249	
----------	--	-------	--

SEAGATE

ST01 ST02		\$29	\$45
ST07 ST08		\$29	\$39
ST11 M ST11 R		\$51	\$51
ST21 M ST21 R		\$57	\$39
ST22 M ST22 R		\$67	\$65

FLOPTICAL DRIVES

SMART & FRIENDLY

21MB Floptical Drive

With Optical Servo Tracking Technology
Internal \$339 • External \$389

FLOPPY DRIVES

SONY

3.5" without Frame 1.44MB PC AT		\$55	
---------------------------------	--	------	--

CANON

ALL MEDIA FLOPPY The All-In-One 3.5" &
5.25" Half Height Internal Floppy Drive \$139

AMERICAN POWER SUPPLY

Back Ups

250 400		\$99	\$159
450 600		\$189	\$264
900 1250		\$369	\$489

Smart Ups

400 600		\$299	\$389
900 1250		\$559	\$729
2000 FREE DELIVERY		\$1299	

TAPE BACK UP

COLORADO MEMORY

DJ10-120MB		\$185	
Adaptors AB11 Ext / KE10 Ext		\$37	\$109
DJ20-250MB		\$235	
Adaptors FC10 Int / KE10 Ext		\$79	\$109
TRAKKER External Parallel Port Tape Backup			
JT10 (40-120) / JT20 (80-250)		\$335	\$395

NETWORKING

ARTISOFT

AE 2T Ethernet Adaptor		\$193	
AE 2 Ethernet Starter Kit Adaptor		\$445	\$193
AE 2 Windows Starter Kit		\$595	
AE 3 ISA Starter Kit Adaptor		\$515	\$225
AE 3 Windows Starter Kit		\$515	
2 Mbps Starter Kit Adaptor		\$319	\$128
2 Mbps Windows Starter Kit		\$385	
2 Two Station Kit		\$81	
10 Base-T Starter Kit		\$579	
Peer Hub 10 Base-T Connector		\$259	
Artisoft Central Station		\$384	
Lantastic Voice Adaptor		\$85	
Network Eye		\$106	
Lantastic for Windows/Network		\$158	\$263
AE 2 Ethernet Software		\$64	
Artisoft / AI V 4.1		\$219	\$57
NewMedia Kit - FREE DELIVERY		\$499	
EtherBasket (12AE 2 or AE 2T) FREE DEL		\$1979	

3COM

Etherlink II TP 8-Bit (3C503B TP)		\$189	
5 Pack FREE DELIVERY		\$919	
Etherlink II 8 Bit (3C503R)		\$185	
5 Pack FREE DELIVERY		\$819	
Etherlink II 16 TP 8/16 Bit (3C5016 TP)		\$179	
5 Pack FREE DELIVERY		\$739	
Etherlink II 16 8/16 (3C503 16)		\$155	
5 Pack FREE DELIVERY		\$719	
Etherlink 16 16 Bit (3C507)		\$275	
5 Pack FREE DELIVERY		\$1289	
Etherlink 16 TP 16 Bit (3C507 TP)		\$295	
5 Pack FREE DELIVERY		\$1429	
Etherlink II 10BT		\$129	
5 Pack FREE DELIVERY		\$599	
Etherlink II		\$129	
5 Pack FREE DELIVERY		\$599	
Tokenlink II 16.4 Bit ISA FREE DEL		\$539	
Tokenlink II 16.4 Bit ISA FREE DEL		\$729	

NOVELL / EAGLE

Netware Lite NE2000 Starter Kit 1.1			
with Lite Mail 3.5" 5.25"		\$389	\$389
Netware Lite Add-on Kit (NE2000) 5.25"		\$199	
Netware Lite Add-on Kit (NE2000) 3.5"		\$199	
NE1000 8 Bit Ethernet Card w/out Cable		\$99	
NE1000 8 Bit 5 Pack FREE DELIVERY		\$469	
NE2000 16 Bit Ethernet Card w/out Cable		\$135	
NE2000 16 Bit 5 Pack FREE DELIVERY		\$599	
Netware Lite Software		\$69	

SMC

EtherCard Elite 16 Combo		\$185	
EtherCard PLUS Elite, 8 Bit 16 Bit		\$119	\$155

• GATEWAY

• INTEL

• THOMAS-CONRAD

• XIRCOM

Call for Details!

MODEMS

ZOOM

AMC 2400 Internal with RPI		\$49	
AMX 2400 External with RPI		\$65	
AFC 2400 Send/Rec 9600 RPI Int		\$59	
AFX 2400 Send/Rec 9600 RPI Ext		\$75	
FC 2400 Send/Rec 9600 Internal		\$79	
FX 2400 Send/Rec 9600 External		\$92	
2400 V 42 Send/Rec 9600 with Winfax			
FCV Internal FXV External		\$115	\$125
V 32 bis Internal External		\$205	\$219
V 32 bis Send/Receive 14 400 Int		\$215	
V 32 bis Send/Receive 14 400 Ext		\$245	
PKT Portable Pocket S/R Fax Modem		\$85	

SUPRA

SupraFaxModem Int. 24-96 NEW		\$59	
2400 Internal w Mirror II		\$51	
2400 External		\$72	
Fax Modem V 32 Ext alone		\$219	
with Fax Software DOS/Win		\$259	\$279
FaxModem V 32 bis Internal - NEW			
with Fax Software DOS/Win		\$219	\$219
FaxModem V 32 bis External alone		\$279	
with Fax Software for DOS		\$299	
with Fax Software for Windows		\$299	
with Fax Software for MAC		\$379	

PRINTERS

PANASONIC

KX P 1123	\$199	KX-P 2123	\$229
KX P 2180	\$169	w/Color Kit	\$279
w/Color Kit	\$219	KX P 2124	\$315
KX-P 1124i	\$285	w/Color Kit	\$359
KX P 1624	\$323	KX P 4430	\$899
KX P 2624	\$365	KX-P 4455	
KX P 4410	\$649	FREE DEL	\$1749

CITIZEN

200 GX 1 with Color Kit	\$155	\$199
200 GX 15 with Color Kit	\$295	\$359
GSX 140 PLUS with Color Kit	\$309	\$335
GSX 145 Wide with Color Kit	\$365	\$425
GSX 230 Quiet Tech. with Color Kit	\$249	\$289
GSX 240 Color Option Available	\$285	
PN48 Notebook	\$289	
PN48 Professional Kit	\$329	

STAR

NX 1001 Multifont	\$135	
NX 1040 Rainbow NEW	\$159	
NX 2420 Rainbow	\$269	
NX 2430 Black	\$215	
Star Jet 48	\$285	

SOUND BOARDS

Sound Blaster	\$95	
Sound Blaster Pro Basic	\$145	
Sound Blaster 16 - NEW	\$219	
Advanced Gravis UltraSound	\$129	
MS Windows Sound System	\$175	
MS Windows Sound System w/Win	\$209	
Audio Port	\$135	
Thunderboard for Windows	\$92	\$105
Pro Audio Spectrum PLUS	\$135	
Pro Audio Spectrum 16	\$189	
Thunder & Lightning - NEW	\$219	
Multisound16 on MPC Free Delivery	\$529	
Audio Master - NEW	\$249	

THE MULTIMEDIA SPECIALISTS

NEC FREE DELIVERY!

CD Express, Portable/Ext.	\$429
74 Multimedia Gallery, Ext.	\$879
• CD-ROM Drive alone •	
CDR 84 Int / 74 Ext	\$545 / \$609

CREATIVE

SB Multimedia Upgrade Kit		
Int. \$519 • Ext. \$589		
CD-ROM Upgrade Kit		
Int. \$359 • Ext. \$439		

SONY NEW BUNDLES

featuring the CD 31A - Call!

MONITORS

PANASONIC C13811

28DP, 1024 x 768

••• \$309 •••

Panasonic C1395 Non-Interlaced		
28DP 1024 x 768		\$429

CTX

5499A 14" 39 1024x768 interlaced		\$245
5468A 14" 1024x768 interlaced		\$275
5468N 14" 28DP 1024x768		
Non-Interlaced		\$305
1560 15" 28DP 1024 x 768 Noninter		\$479
1760LC 17" Flat, 3DP 1280x1024		
Non-Glare Non-Interlaced		\$775

VIDEO BOARDS

DIAMOND

Speedstar 24 1Mg 1 bit 1024x768		\$129
Speedstar 24X 1Mg 24bit 1280x1024		\$155
Stealth 1Mg 32000 colors 1024x768		\$215

SCANNERS

GOLDEN IMAGE

Digital Eye 64 Pro		\$109
Digital Eye 256 Pro (800 dpi)		\$145
Digital Eye Color		\$349

LOGITECH

Scanman Model 256 (gray scale)		\$253
Scanman 256 w/Catchword Pro		\$389
Scanman Color Hand Held Scanner		\$545
PhotoMan		Call

- One of Wisconsin's Top 10 Women Owned Businesses.
- Corporate, Government & School POs Welcome.



- No Surcharge on Credit Cards.
- Most Orders Shipped within 48 Hours.
- Software Shipping only \$5 per order, not per title. Hardware: 5% - Min. \$5.
- C.O.D orders Welcome, with a \$5.00 Charge.
- We Ship Latest Version of Software Available.
- All Products Sold Carry Manufacturers' Full Warranties & Documentation.
- APO, FPO HII, AK Puerto Rico & Canadian orders Welcome: 6% - Min \$6. International Orders Shipped First Class Mail Insured: 15% - Min \$15. If mail cost exceeds calculated amount, you'll be billed additional.
- Call for Free Catalog and Items Not Listed

P.O.Box 17882
Milw, WI 53217
(414) 357-8181
FAX: (414) 357-7814
Toll Free FAX:
(800) 554-9981
HRS: CST
9am-9pm, M-F
11am-5pm, Sat

Prices & availability of hardware and software are subject to change without notice. We do not guarantee compatibility. We are not responsible for manufacturer's errors. All returns must have a Return Authorization number. Call our 800 line to obtain a Return Authorization or your return will not be accepted. Shipping & handling charges are non-refundable. All software is in

SOFTWARE • SOFTWARE • SOFTWARE • SOFTWARE

386 To The Max 8.0 w/Move Em	58.95	Windows V2.1 Windows	11.95-11.95	Righttree Accounting 6.0 w/10	124.95
ACT 2.1 for Win 1.0	14.95-19.95	Win Select 2.0	7.95	Payroll Accounting for Windows	69.95
Amesoft BM 3.0 ROM Windows	28.95	Capem Pro 4.0 Upgrade	9.95-14.95	Plus Accounting	84.95
After Dark for Windows v 2.0	28.95	Lotus Organizer 1.0	0.00	ProImage 1.0 for Windows	149.95
Ami Professional 3.0 Windows	244.95-244.95	Macintosh 5.0 Windows	49.95	PhotoManager 1.0	9.95
Approach for Windows 2.0	24.95	Macintosh 5.0 Windows	49.95	Power Manager Desktop	69.95
AutoMap Windows	52.95-14.95	Managing Your Money v 3.0	41.95	Presentation Task Force 4.0 for Win	176.95
Auto Sketch 3.0 for Win	83.95-149.95	My Address	11.95	Presentation Page 2.0 Win	69.95-99.95
Bilcom - Bill for Windows Bundle	1.95	My Basic Desktop 7.1	3.95-7.95	Putman 1.3.1 for Windows	39.95
BlissWorks	43.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95
Business Calc 3.1 for Windows	14.95	My Basic Desktop 7.1	3.95-7.95	Quick 1.3.1 for Windows	34.95

NEWOBJ.FRQ Complete Listing

```

TYPE
  CardValueType = RECORD
    Suit : SuitType; { An enumeration of Clubs...Spades }
    Spot : SpotType; { An enumeration of Ace...King }
  END; { CardValueType }

  CardType = object(TObject)
  ;
  ;
  constructor Init(var CardValue : CardValueType);
  ;
  end; { CardType }

CONSTRUCTOR DeckType.Init(MumDecks : Byte;
                          CardKind : Pointer;
                          CardCons : Pointer);

VAR
  I, L : Word;

```

```

  J : SpotType;
  K : SuitType;
  Card : CardValueType;
BEGIN
  L := 0;
  FOR I := 1 TO MumDecks DO
    FOR K := Clubs TO Spades DO
      FOR J := Ace TO King DO
        BEGIN
          Inc(L);
          Card.Spot := J; { Setup the values to be passed }
          Card.Suit := K; { to the constructor }
          { Create a new instance of the descendant card type }
          Cards[L] := CardTypePtr(NewByType(CardKind,
                                             CardCons,
                                             Card));
        END;
      END;
    END;
  END;
END;

```



Figure 4: This code fragment shows a possible use for NewObjByType—the DeckType object can initialize cards of any type that's descended from CardType.

NEWOBJTS.PAS Complete Listing

```

PROGRAM NewObjTst;
USES NewObjByType,
  ($IFDEF Windows)
  WObjects,
  WinCrt;
($ELSE)
  Objects;
($ENDIF)

TYPE
  TObj0 = ^TObj0;
  TObj0 = OBJECT(TObject);
  PROCEDURE Who; Virtual;
  END;

  TObj1 = ^TObj1;
  TObj1 = OBJECT(TObj0);
  PROCEDURE Who; Virtual;
  END;

  Dat2 = RECORD
    ix, iy : Word;
  END;

  TObj2 = ^TObj2;
  TObj2 = OBJECT(TObj0);
  X, Y : Word;
  CONSTRUCTOR Init(VAR D : Dat2);
  PROCEDURE Who; Virtual;
  END;

  PROCEDURE TObj0.Who;
  BEGIN

```

```

    WriteLn('I am a TObj0.');
```

```

  END;

  PROCEDURE TObj1.Who;
  BEGIN
    WriteLn('I am a TObj1.');
```

```

  END;

  CONSTRUCTOR TObj2.Init(VAR D : Dat2);
  BEGIN
    TObj0.Init; X := D.ix; Y := D.iy;
  END;

  PROCEDURE TObj2.Who;
  BEGIN
    WriteLn('I am a TObj2 : ',X,', ',Y,',');
```

```

  END;

VAR
  A : ARRAY[0..2] OF TObj0;
  N : Word;
  Dat : Dat2;
BEGIN
  Dat.ix := 42; Dat.iy := $FFFF;
  A[0] := TObj0(NewByType(TypeOf(TObj0), @TObj0.Init, N));
  A[1] := TObj0(NewByType(TypeOf(TObj1), @TObj1.Init, N));
  A[2] := TObj0(NewByType(TypeOf(TObj2), @TObj2.Init, Dat));
  FOR N := 0 TO 2 DO A[N].Who;
  FOR N := 0 TO 2 DO Dispose(A[N], Done);
END.

```



Figure 5: The NewObjTst program demonstrates the ability of the NewObjByType function to initialize an object given only its VMT and the address of its constructor.

scended from Turbo Pascal's TObject type or Object Professional's Root type satisfy this criterion. No validity checking of the VMT or constructor address is performed, and invalid values can cause the system to visit never-never land.

The NewObjByType unit has conditional compilation directives so that it can be used without modification for Turbo Pascal 5.5 (with Object Professional), Turbo Pascal 6.0 (with either Object Professional or Turbo Vision), and Turbo Pascal for Windows. Users of Object Professional and Turbo Pascal 6.0 must remove the period from the statement [.\$define ObjectProfessional] to include Object Professional data types.

*Don Ziesig
Altamonte Springs, Florida*

► **PC MAGAZINE:** Once you plow through the bewildering array of conditional com-

pilation directives, the NewByType function is revealed as a marvel of simplicity. As the author says, its workings are based on the same mechanism used to load objects from streams. Do note, though, that you must write your objects in a particular way if you want to pass initialization data to them via NewByType. It's no great hardship; you just have to write the constructor so that it takes a single VAR parameter. If your object needs 11 data items passed in its constructor, you simply put those items into a record type and pass a variable of that type.

The Card Deck example in Figure 4 may be difficult to grasp, since it is incomplete, so I wrote the simpleminded program NEWOBJTS.PAS, shown in Figure 5. This program defines TObj0 (a descendant of the basic TP6 or TPW TObject) along with two descendants of TObj0. All three have a method named Who, which

reports the type of the object in question. TObj2 has two data fields, initialized via a record variable of type Dat2.

The main body defines an array of three pointers to the TObj0 type; remember, polymorphism means these can also point to any descendant of TObj0. It then initializes each to a different type using NewByType. The first two inherit TObject's constructor, which doesn't take any parameters. Since NewObjByType requires *something* for its Data parameter, the program just passes the index variable N. For the third parameter, the TObj2, the program passes a Dat2 record. To prove that this indirect initialization succeeded, the program calls the Who method of each object. (You can download all files mentioned in this letter, archived as NEWOBJ.ZIP, from the Programming Forum on PC MagNet.) —Neil J. Rubenking



Don't Shoot It, Troubleshoot It.

LANDMARK... the widest selection of PC diagnostic software, firmware, and hardware in the world!

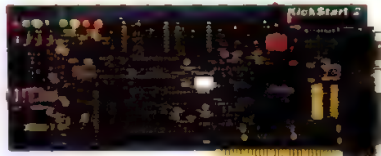
PC WON'T BOOT? KICKSTART IT!

Don't replace your motherboard, use **KickStart 2™**. When serious hardware problems occur, nothing gets you up and running as fast. KickStart 2 *measures power within 2.5% on all four voltages, shows Power-On Self-Test (POST) failure codes, and features on-board ROM-based diagnostics* allowing you to determine and remedy the problem quickly, easily, and inexpensively!

Built-in serial and parallel I/O *allows for testing remote via modem*, or simply logging results to a remote terminal, printer, or laptop. You can configure your own test routines and store them in KickStart 2's battery backed-up CMOS RAM for quick future use. On-board switches, LEDs, and digital displays allow complete control over testing in systems lacking video or disk.

KickStart 2 is the ultimate **SECURITY CARD**, too. With two levels of password protection and pre-O/S activation, you can confidently prevent unauthorized use of your PC.

Includes serial and parallel loopback plugs and the Landmark **JumpStart™** AT ROM BIOS for testing ATs that don't issue POST codes. KickStart 2 works independent of your operating system. You can use it on DOS or UNIX systems. **CALL for current pricing.**



"The number of tests KickStart 2 can perform is mind-boggling... IF THE KICKSTART 2 CAN'T FIND THE PROBLEM, IT PROBABLY EXISTS IN YOUR HEAD, not in the hardware."

Rich Santalesa, Computer Shopper

"KickStart 2 system diagnostics board helps users check out virtually every aspect of a PC's hardware system... THE BOARD IS A WORTHY INVESTMENT for computer maintenance."

David Claiborne, PC Week

PROFESSIONAL LEVEL PC TROUBLESHOOTING

Landmark **Service Diagnostics™** is ideal for professionals requiring the most exhaustive diagnostic test capabilities.

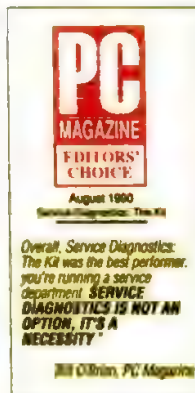
Service Diagnostics is not just a single product, but a complete LINE of products. It's comprised of software, hardware, and firmware so you can choose the best "tool" for the job.

When your PC won't boot, you'll need **ROM POST** firmware, a plug-in chip that virtually "jumpstarts" the system to determine what's wrong. And, when your printer isn't working, you won't know whether it's the LPT port, cable, or printer without hardware, like our loopback plugs (which together with our software completely test the COM ports).

To provide you a complete troubleshooting resource, Service Diagnostics is offered in single modules or in "kits." Components include: CPU-specific software (PC, XT, AT, 386/486, PS/2), ROM POSTS (PC, XT, AT) and floppy alignment disks (3.5" and 5.25").

All the Service Diagnostics software modules are available in self-booting versions for use with non-DOS operating systems like UNIX.

Service Diagnostics is powerful and flexible. Hundreds of tests can be performed on your motherboard, memory, video, COM ports, floppy and hard drives, printer, and more. **CALL for a customized quote on the kit that's right for you!**

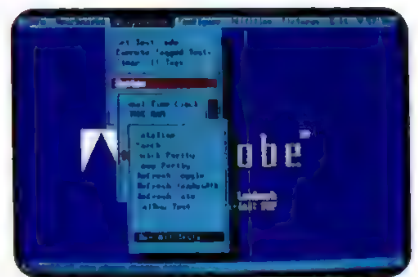


PC DIAGNOSTICS MADE EASY

You don't need to be technical to use **PC Probe™**. With clear, intuitive, pull-down menus and 206 pages of on-line help, troubleshooting your PC is truly **MADE EASY!**

And, you don't have to be handy with a screwdriver to make PC Probe pay for itself. Just by providing a diagnostic report to your service and repair shop, you'll save money and receive quicker service.

PC Probe runs over 150 tests including: motherboard and CPU, memory, video card and display, keyboard, COM ports, floppy drive and controller, hard drive and controller, and more. Includes **VirusCure**, Landmark **Speed Test**, **AT SetUp** & loopback plugs. **CALL for current pricing!**



SLASH HARD DISK SET-UP TIME

If you install, upgrade, or maintain hard drives, then you need **DiskBase™**. It'll save you boat-loads of time and money by putting the exact hard disk information you need at your fingertips... whenever you need it.

DiskBase reveals 12 technical specs on over 2500 hard disk drive models and 8 technical specs on over 220 controllers. Once you've located the correct hard disk model, you can instantly bring up a listing of all compatible controllers. **CALL for current pricing!**

- Toll Free Tech Support
- 90 Day Money Back Guarantee
- Federal Express Shipping

CALL (800) 683-6696

FAX (813) 443-6603 • Int'l (813) 443-1331

LANDMARK
RESEARCH INTERNATIONAL CORPORATION
703 Grand Central Street • Clearwater, FL 34616

Copyright © 1992 PC Probe, AlignIt, KickStart, JumpStart, ROM POST, Service Diagnostics, DiskBase, and Speed Test are trademarks of Landmark Research International Corp. All Rights Reserved. Other names are trademarks of their associated owners.

CIRCLE 168 ON READER SERVICE CARD



COMPUTER DISCOUNT WAREHOUSE™



NEC Ready 425 170 MB HD

- ✓ Intel 486SX 25MHz Microprocessor
- ✓ 4MB RAM Standard, Expandable to 64 MB
- ✓ 8KB Cache
- ✓ 1640 x 480 x 16.8 Million Colors or 1024 x 768 x 256 Colors
- ✓ 1 MB Video RAM
- ✓ 5.25" and 3.5" Floppy Hard Drives
- ✓ Flash ROM
- ✓ One Parallel, One Serial, One Mouse Port
- ✓ No Wait Video
- ✓ (3) 8-16-Bit Slots
- ✓ DOS 5.0, Windows 3.1, NEC PS/2 Mouse
- ✓ Norton Desktop, Norton AntiVirus, PFS Window-Works 2.0, Delrina Winfax, Prodigy, NEC Small Business Templates
- ✓ 12 Month Onsite Service
- ✓ Novell Certified



CDW® Price **\$1314.62*** CDW 24519

WHY PAY RETAIL?

CDW® Sells
NAME BRAND 486's
For Less



HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

NEC Ready 433 170 MB HD

- ✓ Intel 486DX
- ✓ 33 MHz
- ✓ 4 MB RAM Expandable to 64 MB
- ✓ 8KB Cache
- ✓ 640 x 480 x 16.8 Million Colors or 1024 x 768 x 256 Colors
- ✓ 1 MB Video RAM
- ✓ 5.25" and 3.5" Floppy Drives
- ✓ Flash ROM
- ✓ 1 Parallel/1 Serial + Mouse Port
- ✓ No-Wait Video (New Zero Wait State Technology Means Faster Graphics)
- ✓ 3-8, 16 Bit Slots
- ✓ DOS 5.0, Windows 3.1, NEC PS/2 Mouse
- ✓ NEC/Norton Desktop, Norton AntiVirus, PFS WindowWorks 2.0
- ✓ Delrina Winfax, Prodigy, NEC Small Business Templates
- ✓ Quicken w/2 Months Free Electronic Checking
- ✓ 12 Month Onsite Service
- ✓ Novell Certified



CDW® Price **\$1659.29*** CDW 24522

NEC NEC NEC NEC



Canon INNOVA 486SX/25 Desktop Model 1 130 MB HD

- ✓ 80486SX/25 MHz, CPU Upgradable to 4 MB Exp. to 34 MB, 8KB Internal Cache Memory, 64KB External Cache Memory
- ✓ 3.5" (1.44 MB) and 5.25" (1.2 MB) Floppy Drives
- ✓ 4 Drive Bays
- ✓ VGA: 1024 x 768 Video Support
- ✓ 1 Parallel & 2 Serial Ports
- ✓ 101 Key Keyboard
- ✓ Mouse, Windows Pre-Installed
- ✓ One Year On Site Warranty

CDW® Price **\$1309.23*** CDW 24283

DTK Grafika 486 200 MB HD

- ✓ 486DX Processor
- ✓ 64 KB Cache
- ✓ 8 Expansion Slots
- ✓ 1024 x 768, 1 MB Display Video/Memory
- ✓ 8 MB RAM Memory, Expandable to 32 MB
- ✓ 1.2 MB 5.25" and 1.44 MB 3.5" Floppy Drives
- ✓ Mouse and Keyboard
- ✓ Two Serial and One Parallel Port
- ✓ MS-DOS® and Microsoft® Windows 3.1 Software



33MHz Desktop... **\$1728.41*** CDW 23771

33MHz Tower... **\$1807.95*** CDW 23772

50MHz Tower... **\$1951.14*** CDW 26337

66MHz Tower... **\$2346.59*** CDW 26338



AST Bravo 4/25s 120 MB HD

- ✓ 486SX, 25 MHz Processor
- ✓ 4 MB RAM Standard, Expandable to 64 MB
- ✓ Integrated SVGA Video, Supports 1024 x 768 x 256
- ✓ 512 KB Video RAM, Upgradable to 1 MB
- ✓ 72 mHz Refresh Rate
- ✓ 8514/A Pass Through Connector
- ✓ Support for True Colors Modes
- ✓ 1.44 MB 3.5" Diskette Drive
- ✓ 2 External 5.25" Drive Bays, 2 Internal 3.5" Drive Bays
- ✓ Four Full-Sized 16 Bit ISA-Compatible Slots
- ✓ Two Serial Ports, One Bi-Directional Parallel Port, 6 Pin PS/2-Compatible Mouse Port
- ✓ MS-DOS 5.0 from AST

CDW® Price **\$1019.73*** CDW 24368

*Monitor Not Included

AST Bravo 4/33 120 MB HD

- ✓ 486, 33 MHz Processor
- ✓ Integrated 8KB Cache Memory
- ✓ Integrated 387-Compatible
- ✓ Intel Overdrive Upgrade Support
- ✓ 256 KB Second Level Cache Memory Support
- ✓ 4 MB RAM Stand., Exp. to 64 MB
- ✓ Integrated SVGA Video
- ✓ Supports 1024 x 768 x 256
- ✓ 512 KB Video RAM, Upgradable to 1 MB
- ✓ 72 Hz Refresh Rate
- ✓ 8514/A Pass Through Connector
- ✓ Support for True Color Modes
- ✓ 1.44 MB 3.5" Drive
- ✓ 2 Ext. 5.25" Drive Bays, 2 Internal 3.5" Drive Bays
- ✓ 4 Full-Sized 16-Bit ISA Compat. Slots
- ✓ 2 Serial Ports, 1 Bi-Directional Parallel Port, 6-Pin PS/2-Compatible Mouse Port
- ✓ MS-DOS 5.0

CDW® Price **1349.52*** CDW 24371

AST, AST logo and Bravo are registered trademarks AST Research, Inc. All other product or brand names are trademarks or registered trademarks of their respective companies.



AST Bravo 4/50d 120 MB HD

- ✓ 486DX2, 50 MHz Processor
- ✓ 4 MB RAM Standard, Exp. to 64 MB
- ✓ Internal SVGA Video
- ✓ Supports 1024 x 768 x 256
- ✓ 512 KB Video RAM, Upgradable to 1 MB
- ✓ 72 Hz Refresh Rate
- ✓ 8514/A PassThrough Connector
- ✓ Support for True Color Modes
- ✓ 1.44 MB 3.5" Drive
- ✓ Two External 5.25" Drive Bays, Two Internal 3.5" Drive Bays
- ✓ Four Full-Sized 16-Bit ISA Compatible Slots
- ✓ Two Serial Ports, One Bi-Directional Parallel Port, 6-Pin PS/2-Compatible, Mouse Port

CDW® Price **1789.10*** CDW 24374



AST Bravo 4/66d 120 MB HD

- ✓ 486DX2, 66 MHz Processor
- ✓ 4 MB RAM Standard, Expandable to 64 MB
- ✓ Integrated SVGA Video
- ✓ Supports 1024 x 768 x 256
- ✓ 512 KB Video RAM, Upgradable to 1 MB
- ✓ 72 Hz Refresh Rate
- ✓ 8514/A Pass Through Connector
- ✓ Support for True Color Modes
- ✓ 1.44 MB 3.5" Drive
- ✓ Two External 5.25" Drive Bays, Two Internal 3.5" Drive Bays
- ✓ Four Full-Sized 16-Bit ISA Compatible Slots
- ✓ Two Serial Ports, One Bi-Directional Parallel Port, 6-Pin PS/2-Compatible, Mouse Port
- ✓ MS-DOS 5.0 Software from AST Included

CDW® Price **2048.48*** CDW 24375

MOST ORDERS RECEIVED BY 7:30 P.M. C.S.T. SHIP SAME DAY

IF YOU FIND A BETTER PRICE CALL US BEFORE YOU BUY
2840 MARIA, NORTHBROOK, IL 60062 FAX (708) 291-1737

CDW® Carries Over 7000 Computer Products At Discount Prices. If You Don't See It, Call!

WHY WAIT? CALL COMPUTER DISCOUNT WAREHOUSE™ NOW!

PCM506

CDW® EXTENDED HOURS
9:00 AM - 7:00 PM C.S.T.
FREE Ship Support for Customers
(708) 291-1737 902-239 C.S.T. Mon-Fri.

Credit Card charges are not submitted until time of shipment. Freight is calculated on the carrier's actual freight charge plus insurance and handling charges. The rate of insurance is 0.30% of the order total. Shipping charges will not exceed \$4.00 per 100 lbs. (weight order or 80.00 per multi-package shipment). For your protection, we ship only to your verified billing address. Non-delivery returns subject to reshipping fee. After 15 business days the shipping address may be changed. Software, chips and other electronic components are not returnable. All pricing subject to change. * Excludes all non-computer items in this ad.



(800) 326-4CDW

In Illinois FAX
(708) 564-4900 (708) 291-1737

©1993 CDW® Computer Centers, Inc.



COMPUTER DISCOUNT WAREHOUSE™
SERVICING YOUR PC NEED SINCE 1982 - DON'T ACCEPT ANY IMITATIONS.

No Surcharge for Credit Cards



High Volume Bids Invited



COMPUTER DISCOUNT WAREHOUSE™



1 OF THE
NATION'S
LARGEST
OKIDATA
DEALERS

WHY PAY RETAIL?

**CDW® Sells
For Less**

AND **SERVICES** YOU BETTER

TAKE IT FROM THE EXPERTS:
ONLY CDW® CAN SAY THIS

- ✓ EXCEPTIONAL QUALITY
- ✓ EXCELLENT VALUE
- ✓ TREMENDOUS SELECTION
- ✓ BUY WITH CONFIDENCE*
- ✓ 10 YEARS OF QUALITY SERVICE

*Same Day Shipment On Most Orders

Celebrate Sensational Savings with CDW & OKIDATA!

OL810

The Value-Packed Printer For Growing Businesses

- ✓ LED Page Printer ✓ 8 PPM
- ✓ 300 DPI, OKI Smoothing Technology* ✓ 1 MB RAM
- Standard ✓ 5 MB RAM Maximum
- ✓ HP® LaserJet® III, IBM® Proprinter III XL, OKIDATA OL400
- Compatibility ✓ 200 Sheet Paper Tray ✓ 13 Resident Scalable Fonts, 42 Bitmap Fonts ✓ PostScript Upgradable ✓ Industry's Best Warranty: 5 Years. on Printhead, 1 Year Parts/Labor on Printer

**CDW Price
\$1029.15**

CDW 23104

OKIDATA®



OL400

The Personal LED Page Printer for Smaller Budgets

- ✓ 4 PPM ✓ 300 DPI ✓ More Standard Typefaces & Fonts than HP® LaserJet® IIP ✓ High-Capacity 200-Sheet Paper Tray Included
- ✓ Slim Low-Profile Design Fits Any Desktop ✓ HP® Series II Compatible
- ✓ Industry's Best Warranty: 5 Years. on Printhead, 1 Year Parts/Labor on Printer

**CDW Price
\$569.00**

CDW 12884

Call For Printer Accessories

OL830

The Revolutionary PostScript LED Page Printer Is Reliable, Fast, Compatible and Affordable

- ✓ 8 PPM with Adobe PostScript and ATM 2.0 Standard ✓ HP LaserJet® Series II Emulation
- ✓ 2 MB RAM ✓ Parallel Interface ✓ 17 PostScript Fonts
- ✓ Second Paper Tray. Serial and Apple Talk Interfaces Optional
- ✓ Industry's Best Warranty: 5 Yrs. on Printhead, 1 Yr. Parts/Labor on Printer

CDW Price \$1256.96 CDW 19896

OL840

The Postscript LED Page Printer for Your Environment

- ✓ 8 PPM ✓ 300 DPI Resolution
- ✓ 26 Bit-mapped and 35 Adobe PostScript Fonts--More Than LaserJet III ✓ HP Series II & Diablo Compatible ✓ 200-Sheet Paper Tray/2nd Tray Available
- ✓ IBM & Macintosh Compatible ✓ Industry's Best Warranty: 5 Years on Printhead, 1 Year Parts and Labor on Printer

CDW Price \$1564.13 CDW 16172

**CDW® Carries the Complete Line of OKIDATA:
LED Page Printers, Dot Matrix Printers
and Accessories!**

**MOST ORDERS RECEIVED
BY 7:30 P.M. C.S.T.
SHIP SAME DAY**

IF YOU FIND A BETTER PRICE CALL US BEFORE YOU BUY
2890 MARLA, NORTHBROOK, IL 60062 FAX (708) 291-1737

PC Magazine says... "You may find a better deal here than anywhere else."

WHY WAIT? CALL COMPUTER DISCOUNT WAREHOUSE™ NOW!

PCM596

WE SELL NAME BRAND ITEMS FOR LESS!

(800) 326-4CDW

In Illinois **(708) 564-4900** FAX **(708) 291-1737**



**COMPUTER DISCOUNT
WAREHOUSE™**
SERVICING YOUR PC NEED
SINCE 1982. DON'T ACCEPT ANY
IMITATIONS.

No Surcharge on Credit Cards



High Volume Bids Invited

©1993 CDW Computer Centers, Inc.

CDW® EXTENDED HOURS
7:30-7:30 C.S.T. Mon-Fri
8:00-8:00 C.S.T. Sat-Sun
(708) 291-1737



COMPUTER DISCOUNT WAREHOUSE



US Robotics Sportster 14,400 Fax Modem

High Quality and
Performance on a Budget

- ✓ 9600 bps Group 3 Send/Receive Fax
- ✓ 14,400 Data V.32bis with V.42 bis
- ✓ Data Throughput up to 57,600 bps
- ✓ Auto-Answer/Auto-Dial
- ✓ Built-In Speaker with External Volume Control
- ✓ 9 LED Status Lights, Call Progress Detection
- ✓ Full 5 Year Warranty
- ✓ Made in the U.S.A.



CDW Price **\$319.98** CDW 22682

WHY SETTLE FOR LESS?

CDW® SERVICING
YOUR COMPUTER
NEEDS SINCE 1982

Canon INNOVA 386SX/33 85 MB HD

- ✓ AMD 80386SX/33 MHz CPU
- ✓ 2MB RAM, Exp. to 16 MB
- ✓ 3.5" (1.44 MB), 5.25" (1.2 MB)
- ✓ 4 Drive Bays, 1 Bay Avail., Half-Height
- ✓ Super VGA Support 1024 x 768, 512 KVideo RAM, Exp. to 1 MB
- ✓ 1 Par. Port, 2 Serial Ports, 1 Mouse Port, 1 Keyboard Port (PS/2 Type)
- ✓ 16-Bit Exp. Slots, 4 Slots Avail.
- ✓ 101-Key Keyboard
- ✓ PS/2 Type Mouse
- ✓ INNOVA Mouse Pad
- ✓ MS-DOS V5.0, MS-Windows V3.1, MS-Works for Windows
- ✓ Pre-installed
- ✓ One Year On-Site Warranty, Toll Free Hot-Line Available from Canon
- ✓ Monitor Not Included



CDW Price **\$829.55** CDW 24281

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

NETWORKING PRODUCTS

NOVELL

NOVELL Netware V2.2, 5-User 3.5"	\$479.50
NOVELL Netware V2.2 10 User 3.5"	1055.43
NOVELL Netware V2.2 50 User 3.5"	2084.78
NOVELL Netware V2.2 100 User 3.5"	2975.57
NOVELL Netware V3.11, 10 User 3.5"	875.50
NOVELL Netware V3.11, 10 User 3.5"	1319.00
NOVELL Netware V3.11, 20 User 3.5"	1829.00
NOVELL Netware V3.11, 50 User 3.5"	2619.10
NOVELL Netware V3.11, 100 User 3.5"	3667.35
NOVELL Lite WinVr DOS	69.00
NOVELL Lite Starter Kits	399.77
NOVELL Lite Add-On Kit	209.65
ETHERNET Interface Connector (NE1000)	129.44
ETHERNET Board (NE2000)	136.05
ETHERNET EISA (NE3200)	687.50

ARTISOFT

ARS-190 AE/1T 10 Base T Adapter, 8-Bit	\$139.82
ARS-170 AE/2T Ethernet ISA Adapter, 16-Bit	199.58
ARTISOFT NOS AI Software	54.50
E143 Ethernet Adapter Kit	199.58
LANtastic Ethernet Starter Kit 4.0	448.31
LANtastic Ethernet Starter Kit for Windows	509.10
LANtastic 2Mbps Starter Kit	325.50
LANtastic 10 Base T Starter Kit	589.20
LANtastic 2Mbps Adapter	129.54
LANtastic for Windows	159.00

CALL FOR ADDITIONAL ARTISOFT PRODUCTS

SMC® ANTENNIERIES

SMC 3512 TP 12 Node Concentrator	\$719.18
Active Hub 8 Port Coax	224.58
Active Hub 8 Port Twisted Pair	345.68

SMC INTERFACE CARDS

3008 Coax 8-Bit Ethernet	\$89.82
3008 TP 10 BaseT 8-Bit Ethernet	113.53
3016 TP 10 BaseT 16-Bit Ethernet	134.50
PC 400FS Coax Arcnet File Server 16-Bit	199.00
PC 650WS TP Arcnet Workstation 16-Bit	122.86
PC 650FS TP Arcnet File Server 16-Bit	205.25
PC 600WS Coax Arcnet Workstation 16-Bit	122.86
SMC PC130C 8-Bit Arcnet Coax	68.50
SMC PC130C 8-Bit Arcnet Coax	90.00
SMC PC270 TP Arcnet	109.33
Eisa 3200 Arcnet Twisted Pair	736.00
SMC 8-Bit 10 Base T Ethernet Elite	119.48
SMC Ethernet Plus/A PS/2 Coax Elite	224.10
SMC 16-Bit Ethernet Plus Coax Elite	127.50
SMC 8-Bit Ethernet Plus Coax Elite	105.29
SMC Combo Ethernet TP, Coax, AUI Elite	189.57

3Com

3COM 3C503 TP 10 Base T	\$229.80
3COM 3C507 Ethernet Card	279.81
3COM 3C503 Etherlink	188.24
3COM Ethernet Repeater	833.03

THOMAS-CONRAD

6242 Arcnet 8-Bit	\$60.20
6245 Arcnet 16-Bit	179.31
6245 Twisted Pair Plus Ethernet	229.07
6245 Twisted Pair Plus Ethernet	214.16
6151-11 16 Port Smart Hub	706.21
4045 16/4 Token Ring XT AT	488.03

XIRCOM

Arcnet Pocket Adapter Coax	\$244.50
Arcnet Pocket Adapter RJ45	239.77
Ethernet Pocket Adapter Thin Coax	314.55
Ethernet Pocket Adapter 10 Base T	329.55
Parallel Port Multi	75.00
PTO4BT Token Ring Pocket Adapter	486.23

TAPE, REMOVABLE & FLOPPY DRIVES

NEW!

OMEGA

OMEGA Tape 250 250MB Tape Back-up	\$246.59
OMEGA Bernoulli PC Powered 90 Pro	489.25/589.57
OMEGA Bernoulli Transportable 90 Pro	689.81
OMEGA Bernoulli Transportable 150 Pro	859.25
OMEGA Bernoulli Insider 90 Pro	556.47
OMEGA Bernoulli External Dual 90 Pro	1509.89

COLORADO

COLORADO Jumbo 120	\$189.37
COLORADO Jumbo 250	239.32
COLORADO QFA700	719.15
SYDOS Puma 44MB Ext.	363.93
SYDOS Puma 88MB Ext.	479.92

Call For Accessories And Interfaces

Mountain

MOUNTAIN 120MB Internal Tape Drive	\$239.80
MOUNTAIN TD250 Internal Tape Backup	297.89
MOUNTAIN 120MB External Tape Drive	449.90
MOUNTAIN 250MB Internal Backup	474.42
MOUNTAIN 304MB Internal IDE Backup	439.50
MOUNTAIN 250MB External Backup	509.22
MOUNTAIN 2.0 Gigabyte External Fileshare	2829.77
MOUNTAIN 4.0 Gigabyte 4mm DAT	3966.23

Call For P2 Drive, Controllers, Accessory Kits and Tapes

IRWIN

IRWIN A120PC-120 MB Internal	\$219.19
IRWIN A250PC-250 MB Internal	279.89
IRWIN A120C-120 MB High Speed External	289.13
IRWIN A250C-250 MB High Speed External	346.68

Call For Controllers, Accessory Kits and Tapes.

SUMMIT

SUMMIT 120MB Int.	\$185.39
SUMMIT 250MB Int.	229.34
SUMMIT 305MB, Internal IDE 10MB/min	279.90

MICROSOLUTIONS

MICROSOLUTIONS Ext. 100MB HD	\$499.06
MICROSOLUTIONS Backup Ext. Floppy 3.5"	188.41
MICROSOLUTIONS Backup Ext. Floppy 5.25"	188.41
MICROSOLUTIONS Ext. 40MB Tape Backup	379.50

NETWORKING PRODUCTS

IBM TOKEN RING

IBM 16/4 PS/2 MCA	\$609.11
IBM 16/4 XT/AT	498.27
IBM 16/4 Multi Access Unit MAU	432.26

INTEL NETWORKING

INTEL Token Express EISA 16/4	\$626.88
INTEL Ether Express 16-Bit Coax	123.53
INTEL Ether Express 16-Bit TP	122.33
INTEL Token Express XT AT 16/4	497.23
INTEL Ether Express EISA 32-Bit	539.30

BORLAND dBase IV LAN Pak \$626.37

BORLAND Quattro Pro Network Node 244.30

CC Mail Products CALL

FIFTH GENERATION Direct Access Network 344.57

HARVARD GRAPHICS LAN Pack CALL

LOTUS 1-2-3 2.4 Server 558.06

LOTUS 1-2-3 2.4 Network Node 338.47

LOTUS 1-2-3 3.1 Server 509.39

LOTUS 1-2-3 3.1 Network Node 428.16

MICROSOFT Word 5.5 Network Node 185.39

MICROSOFT Excel Network Nodes 249.11

WORD PERFECT Office 5-User V3.01 278.79

WORD PERFECT Office 20PK V3.01 923.05

WYSE 50 Amber or Green \$356.15

WYSE 60 Amber or Green 289.92

WYSE 180/30 Amber or Green 333.96/284.99

WYSE 185 VT320 Amber, Green or White 333.80

WYSE 150 Amber, Green or White 289.45

WYSE 12th Color 32ES Low Emision 549.40/569.39

MULTIMEDIA, SOUND, CD's, FAX

ARTISOFT, Wired for Sound	39.49
ATI Stereo FX Sound Card	109.76
BHOSE RBUND Cammen San Diego Deluxe CD	59.10
CompleteFax 9800	399.30
COMPLETE PC Communicator	299.55
COMPLETE PC Portable Fax	299.55
CD-ROM Software 5 CD's Bundle, Call For Titles	109.18
COREL SYSTEMS Artshow	179.25
COREL SYSTEMS Draw CD	449.29
Creative Labs Sound Blaster	95.93
Creative Labs Sound Blaster PRO BASIC	149.18
Creative Labs Sound Blaster Professional	189.28
CREATIVE LABS Multimedia Starter Kit	449.82
CREATIVE LABS Multimedia Int Upgrade Kit	549.82
INTELLICOM Long Link	117.79
JET FAX 1 Send Rec Plain Paper Facs on Your Laser	579.32
KEYTRONICS 101 Keyboard	83.50
MICROSOFT Beethoven's 9th For Windows CD	49.90
MICROSOFT Bookshelf For Windows	119.20
MICROSOFT Multimedia Day Kit Windows	300.40
MICROSOFT Programmer's Library	249.75
MICROSOFT Works for Windows CD	129.20
ORCHARD Sound Producer	149.43
PACIFIC DATA Connect 1.25MB	329.58

CD-ROM & OPTICAL DRIVES

HITACHI 3600	\$409.30
HITACHI 1700S External	467.42
MAGNAVOX 461RS Ext. w/CD Bundle	379.00
MAGNAVOX Int. 1700C 1204	299.99
NEC CDR 25 Express Bundle	400.23
NEC CDR 17 External Portable	379.40
NEC CDR 74 External	594.36
NEC CDR 74 Multi-Media Bundle	819.32
NEC CDR 164 Internal	519.81
MAGNAVOX Int. 1700C 1204	219.91
PANASONIC JF7010 Ext. 1 Gb Erasable Optical	2599.20
SONY CDU-720N External CD-ROM	453.10
SONY CDU 535 Internal CD-ROM	299.10
SONY CDU-5410 Internal SCSI CD-ROM	418.32
SONY SMC-5511 Internal Erasable Optical	2995.42
TOSHIBA 1301 External	509.44

PLOTTERS, DIGITIZERS & SCANNERS

KURTA 12 x 12 XLP/12 x 18 XLP	\$234.50/549.29
KURTA 12 x 17	\$38.27

CalComp

CALCOMP 12 x 12 w/16 Bit	CALL
CALCOMP 12 x 18 w/16 Bit	CALL
CALCOMP 2024/2036 Pacesetter	CALL
CALCOMP Design Mate 3024	CALL

Summagraphics

Summagraphics Summa II 12 x 12	\$289.00
Summagraphics Summa II 12 x 18	509.80
COMPLETE PC Full Page Scanner	\$226.06
EPSON ES800C Color SCSI Scanner	\$37.99
EPSON ES800C Color SCSI Scanner	1088.40

HOUSTON INSTRUMENT

HOUSTON INSTRUMENTS DMP-611	2075.00
HOUSTON INSTRUMENTS DMP-161	\$2519.49
HOUSTON INSTRUMENTS DMP-162	3399.51

HEWLETT PACKARD

HP7575 DXL/HP7575A EXL	\$3098.88/3367.25
HP7475A/HP7550B	1309.25/2990.70
HP DESIGNJET 500 A D	5879.35
HP DESIGNJET T 600 A E	8949.30
HP SCANJET IIP/HP7570A	848.10/2529.36
HP SCANJET IIC Color XT-AT	1439.10

No Surcharge For Credit Cards...
Means LOWER Net Cost To You!

SOFTWARE

ACT! Software #1	\$209.60
ADAPTEC CD Software Driver	69.87
AUTODESK AutoSketch	85.83
BANNER BLUE Orig. Plus Advanced	62.30
BORLAND dBase IV 1.5	469.12
BORLAND dBase IV 2.0	54.87
BORLAND Turbo C++	69.98
BORLAND Turbo Pascal	93.80
BORLAND C++ V3.0	88.58
BORLAND C++ App Framework	457.98
BORLAND Paradox V 4.0	419.70
BORI AND Paradox V 4.0 Node	325.40
BORLAND Quattro Comp Upgrade	89.78
BORLAND Quattro Pro 4.0 Win/DOS	289.95
CA Clipper V5.0	459.42
CA Simply Business	389.48
CA Up To Date	96.55
CENTRAL POINT PC Tools V8.0	118.65
CLARION Profession: Developer	433.33
DAC Easy Accounting 4.2	65.33
DAC Easy Bonus 4.2	129.31
DELPHINA DOS Fax Pro	49.91
FIFTH GENERATION Maple US 1980	89.80
FIFTH GENERATION Fastback Plus 3.1	89.93
FIFTH GENERATION Direct Access	52.77
GEOWORKS PRO	119.42
GENERIC Quickd 6.0	273.10
INTUIT Quicken 6.0	39.93
INTEL LAN Fax	199.67
INTEL LAN Spool 286/386	257.10/389.21
LOTUS 1-2-3 V2.4	319.95
LOTUS 1-2-3 V3.1 Plus	385.50
LOTUS Agenda V2.0	125.81
LOTUS Double Up Upgrade	185.54
LOTUS Freelance Graphics	339.78
LOTUS Magellan	65.95
LOTUS Organizer	CALL
LOTUS Symphony	445.59
LOTUS Upgrades	93.81
MICROCOM Carbon Copy V6.0	109.37
MICROSOFT C Compiler 6.0	298.60
MICROSOFT C Compiler 7.0 Upgrade	134.50
MICROSOFT DOS 5.0 Upgrade	59.98
MICROSOFT Flight Simulator 4.0	39.93
MICROSOFT Fortran Compiler 5.0	274.44
MICROSOFT Foxpro 2.0	479.18
MICROSOFT Fox Pro 2.0 6 User	539.36
MICROSOFT PowerPoint Upgrade	98.77
MICROSOFT Quick Basic Compiler 4.5	64.75
MICROSOFT Upgrades	CALL
MICROSOFT Visual Basic	119.20
MICROSOFT Word V5.5	199.90
MICROSOFT Works	99.92
MICROSOFT Excel (Upgrade 3.0 to 4.0)	94.44
PC Kwik Power Pack	68.88
POWER UP! Calendar Creator Plus	49.80
PROCOMM Plus	63.87
QUARTERDECK Designview 386 V2.4	129.86
QUARTERDECK OEM 386 Manager	59.90
QUARTERDECK O'Rem & Manifest	49.30
QUARTERDECK Designview	72.19
QUALITAS 386 Max 5.0	58.95
REFERENCE Grammatik	59.25
SOFTWARE PUB. PFS: Write	154.30
SOFTWARE PUB. Harvard Graphics V3.0	367.89
STACKER SOFTWARE	89.94
STACKER Software And Board For AT 16 Bit	179.99
SYMANTEC NORTON Advanced Utilities V6.0	109.90
SYMANTEC NORTON Commander	83.24
SYMANTEC PC Anywhere Remote	62.11
SYMANTEC PC Anywhere Node	22.80
SYMANTEC Q & A 4.0	244.08
SYMANTEC Q & A Lan Pack 4.0	308.01
TRAVELING SOFTWARE Lapslink Pro	95.98
WORDPERFECT 5.1 5.25" or 3.5"	257.85
WORDPERFECT LetterPerfect	84.11
WORDPERFECT 5.1 Node w/o Manual	159.57

AT CDW® YOU GET MORE COMPUTING FOR YOUR BUCK. CALL NOW!

♦ CDW® means Service ♦ CDW® means Savings ♦ CDW® means Business ♦ CDW® means Experience
♦ CDW® means Technology ♦ CDW® means Networking ♦ CDW® means Computing

FREE TECHNICAL SUPPORT
FOR CDW® CUSTOMERS
(708) 291-7575

(800) 326-4CDW
WE SELL NAME BRANDS FOR LESS!

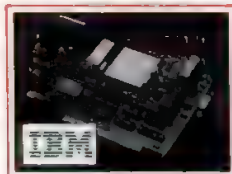
ALWAYS WORKING TO
KEEP YOUR COMPUTING
ONE STEP AHEAD.

COMPUTER DISCOUNT WAREHOUSE

IBM 16/4 Token-Ring Adapter

CDW...Your New #1
Direct Source for IBM
Peripherals

With the IBM 16/4
Adapter Card Your
Network Users Can
Communicate at Speeds
Up to 16 Megabytes
Data Per Second on an
IBM Token-Ring
Network. Winner of 1992 ComputerWorld Brand
Preference Awards & the 1992 LAN Times Reader's
Choice Award



CDW Price.....\$498.27 CDW 11330

WHY PAY RETAIL?

CDW® Sells For Less

AND SERVICES YOU BETTER



HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

COMPUTERS		DOT MATRIX & LASER PRINTERS		MODEMS & COMMUNICATIONS		WINDOWS SOFTWARE	
AST		EPSON		Robotics		ACI Software For Windows	
AST POWEREXEC 325SL 4MB 160HD, Color	\$438.92	LX810 \$165.03	LQ870 435.00	16.8/14.4 Courier Dual Std. Ext. w/ Fax	\$709.65/799.46	LOTUS 123 For Windows	\$335.00
AST POWEREXEC 325SL 4MB 120HD	\$226.40	FX870 \$298.74	LQ1170 589.27	14.4 Courier V.32 Bis. Ext. Int.	509.05/379.21	LOTUS AMI Professional for Windows 3.0	239.00
AST POWEREXEC 325SL 4MB 80HD	2109.80	EPL 7500 Laser P1	1889.00	16.8 HST Courier Ext.	499.10	LOTUS Freelance	336.30
AST POWEREXEC 425SL 4MB 200HD, Color	\$3579.33	LQ570 264.40	LQ1070 374.20	14.4 Sportster w/Fax External/Internal	319.98/399.50	LOTUS SmartSuite for Windows	455.24
AST Power Premium 486SX 4MB 1MB VGA 1 Floppy	1973.26	FX1050 356.99	Action Laser K6PPM	9800 Sportster w/Fax External/Internal	298.44/275.22	MICROSOFT Windows 3.1	89.95
AST Power Premium 486SX 4MB 1MB VGA 1 Floppy	3042.30	DFX 1050 1278.00	DFX8000 2147.00	14.4 Sportster External/Internal	305.30/275.30	MICROSOFT Windows Upgrade 3.1	48.95
AST Power Premium 486SX 4MB 1MB VGA 1 Floppy	3042.30	EPSON AP3250	215.13	14.4 Sportster External V.42	149.91	MICROSOFT Win 3.1 After Dark Bundle	105.50
AST Bravo 4/33 2MB 1 Floppy, VGA, DOS	1159.22	EPL 8000 Laser, 10 Pages Per Minute	1099.13	9600 V.32 Modem External w/Fax	359.58/429.73	MICROSOFT Office	119.20
AST Bravo 4/33 2MB 1 Floppy, VGA, DOS	789.70	NEC		HAYES		MICROSOFT Excel for Windows 4.0	289.25
AST Bravo 4/50d 2MB 1 Floppy, VGA, DOS	1587.85	Starwriter II 95 \$1579.33	P6300 3099.50	ULTRA 144 V.32 External	8630.36	MICROSOFT Project for Windows	409.10
AST Bravo 4/66d 2MB 1 Floppy, VGA, DOS	1853.04	Starwriter II 97 399.92	P3200 24-pin 219.88	HAYES OPTIMA 9600 V.32/Fax96	338.50/399.20	MICROSOFT Windows 3.1 Developers Kit	219.47
Canon		P3300 24-pin 322.58	P9300 969.21	HAYES OPTIMA 14.4 w/Fax	419.58/455.10	MICROSOFT Windows for wkgps starter	529.18
INNOVA 386SX/33 Desktop 2 MB 85HD	\$29.58	Canon		HAYES 9600 External	579.08	MICROSOFT Windows for wkgps Add-on User	59.95
INNOVA 386SX/33 Desktop 4 MB 105HD	90.76	CANON BJ10EX/B20 Bubble Jet	297.40/329.58	HAYES OPTIMA 2400/Fax96	123.34/134.98	MICROSOFT Windows for wkgps 5 User	239.50
INNOVA 386SX/33 Desktop 4 MB 130HD	1309.23	CANON BJ200 Bubble Jet	339.12	UDS		MICROSOFT Word for Windows	289.25
INNOVA 486SX/33 Color Notebook 4 MB 120HD	3259.30	CANON BJ300 Bubble Jet	329.20	Fastak Fax32 PC 9600	\$719.18	MICROSOFT Works for Windows	118.20
INNOVA 386SX/25 Notebook 4 MB 60HD	1675.00	CANON BJ300 Bubble Jet	578.84	Fastak Fax32 9600	609.96	ALDUS PageMaker	497.59
DTK Grifika		CANON LBPSX Laser 8PPM	1310.03	PRACTICAL PERIPHERALS		ARTISOFT Lantastic for Windows	159.17
386/25 SX, No HD, 4MB VGA, 2 Floppies	\$774.32	OKIDATA		14 400 V.32 BIS Std Rev FAX External	\$389.22	BERKLEY After Dark for Windows	29.20
386/25 DX, No HD, 4MB VGA, 2 Floppies	\$22.95	ML184 Turbo \$219.33	ML590 \$419.20	14 400 V.32 BIS Std Rev FAX Internal	339.52	BORLAND Turbo C++ for Windows	99.39
486/33 DX, Tower, No HD, 4MB VGA, 2 Floppies	\$1330.88	OK4000 589.00	ML591 187.00	9600 V.32 Ext.	299.10	BORLAND Object Vision 2.0	95.98
486/50 DX, Tower, No HD, 4MB VGA, 2 Floppies	1807.95	OK810 1029.15	ML380 209.00	2400 V.42 Int.	109.10	CAERE Omnipage Professional 2.0	589.42
486/50 DX, Tower, No HD, 4MB VGA, 2 Floppies	1807.95	OK830 1286.96	ML393+ 919.20	2400 Int.	74.95	CALERA Fax Grabber for Windows	95.48
486/50 DX, Tower, No HD, 4MB VGA, 2 Floppies	1807.95	OK840 1584.12	ML393+ Color 959.50	Pocket 2400	96.00	CALERA Wordscan for Windows	398.42
486/50 DX, Tower, No HD, 4MB VGA, 2 Floppies	1807.95	ML320 299.12	ML32 417.00	2400 Ext. FAX Modem 9600	99.50	Carbon Copy for Windows	100.38
NEC		Panasonic		2400 Internal Fax Modem	99.50	COREL SYSTEMS Core Draw 3.0	389.99
ULTRALITE SL20 80 MB Notebook	\$1309.13	11241 \$284.25	1624 \$539.90	Inte		CROSSTALK for Windows	118.85
ULTRALITE SL20 120 MB Notebook	\$1529.91	1123 198.47	1180 187.00	14.4 External \$429.00	2400 External 163.94	DELINIA Win Fax Pro	43.67
ULTRALITE SL25/C Color 80 MB Notebook	2269.28	4430 Laser 909.23	2624 379.56	2400B V.42 128.37	2400 External V.42 148.80	INTUIT QuickDraw for Windows	43.67
ULTRALITE SL25/C Color 120 MB Notebook	2499.30	2180 166.92	2123 244.09	INTEL Set/Fax/Modem 100/200	98.50/284.10	MICROGRAFX Designer 3.1 for Windows	379.42
NEC 386/33 4MB Super VGA 1 Drive	1344.08	1654 539.86	4450 Laser 199.12	INTEL Set/Fax/Modem 400/400E	378.04/429.50	PROCRAM PLUS for Windows	77.91
NEC 486/50	1677.17	4410 Laser Printer/Modem Postscript	618.98/1748.78	MULTI-TECH		SOFTWARE PUBLISHING Superbase 4 for Windows	439.33
NEC Ready 486SX/25, 4 MB, 170 MB, 2 Floppies	1314.82	TEXAS INSTRUMENTS		MULTI-TECH MT932BA 9600	\$487.82	SYMANTEC Norton Backup for Windows	107.61
NEC Ready 486SX/33, 4 MB, 170 MB, 2 Floppies	1689.29	TI MicroLaser PS17/PS36	\$1179.00/1278.26	MULTI-TECH 14.4 Ext Fax/Modem V.32 BIS	\$118.11	SYMANTEC PC Anywhere IV	109.95
TEXAS INSTRUMENTS		TI MicroLaser Basic Modem TurboPlus P5 850	171.99/499.33	MULTI-TECH MT224 9A	279.88	WORDPERFECT for Windows	263.33
TM WIN SL/C-25 486 160HD 2MB	\$171.78	HEWLETT PACKARD		MULTI-TECH MT696EA	499.10	WORDPERFECT For Windows Upgrade	75.95
TM 4000 WIN DX25 160HD 4MB VGA	\$2397.90	H-P LaserJet Model IIID	2229.22	MATH COPROCESSORS		XEROX Ventura Gold for Windows	489.30
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P Deskjet 550C	899.12	INTEL 387DX 16/20/25/33	78.99	VIDEO PRODUCTS	
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	INTEL 387SX 16/20/25	74.95	SAMSUNG 12" Amber Mono	\$84.10
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	INTEL 287XL/287XLT	78.00/78.00	SAMSUNG 14" White Mono	99.80
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	INTEL 487SX/387SL Mobile	454.44/75.86	VGA & SUPER VGA MONITORS	
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	INTEL Rapid CAD For All 386 DX's	229.10	MAGNAVOX Super VGA 1024 x 768 39mm	\$258.24
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	9600 V.32 Int.	258.23	MAGNAVOX 78M/749 Mono 14" VGA	300.00
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	CYRIX FastMath SX16/20/25	68.75	MAGNAVOX 78M/749 Mono 14" VGA	119.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	CYRIX FastMath 287/9 20MHz	75.40	MAGNAVOX 17" CM9217, 31mm	765.58
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	CYRIX FastMath 100/133 MHz DX40 4MHz	76.47/115.06	MAGNAVOX 20 CM84 20 inch	1290.00
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BATTERY BACKUP AND UPS		NEC Multisync 380SX/4FG	\$19.50/739.00
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	AMERICAN		NEC Multisync 50FG/BFG	1265.93/2269.57
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	Smart 1250	\$729.87	NEC Multisync 2A	379.12
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	Smart 400	307.95	MANAID 17" 280 x 1024 28 mm FST	1138.30
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BACK UPS 250	105.25	PANASONIC C1381 1024 x 768 14"	339.78
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BACK UPS 400	150.25	RELISYS 14" 28, 1024 x 768	279.48
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BACK UPS 400 450/600	150.25/199.68/259.84	SAMSUNG C8C 7571, 17", 1280x1024	875.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	Smart 2000	1134.60	SEIKO CM1780CR	1045.15
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	UPS		SONY 1204S / 1304S	336.50/588.80
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BC-250	\$99.30	SONY 1604S, 17", 25mm	1009.42
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BC-500	179.53	SONY 1936, 20", 25mm	1978.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BC-1250 LAN	258.13	Zenith 384M 14", 39, 1024 x 768	239.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	BC-1250 LAN	258.13	VGA & SUPER VGA DISPLAY CARDS	
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI BASIC 16 VGA	59.18
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI GRAPHICS ULTRA +1 MB	299.27
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI GRAPHICS ULTRA + 2 MB	329.55
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI GRAPHICS ULTRA Pro 1 MB	428.97
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI GRAPHICS ULTRA Pro 2 MB	499.62
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI INTEGRA	79.38
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI 8514 ULTRA 1MB	268.18
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI VANTAGE 1MB	215.24
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ATI VGA Wonder LK24 1 MB	148.23
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	BOCA Basic VGA	49.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	DIAMOND Speedstar Stealth	216.99
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	HERCULES Graphics Station Gold 24 x 2	449.22
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	HERCULES Graphics 1 MB	349.50
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ORCHID ProDesigner IIS 1 MB	149.45
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ORCHID 24-Bit Fahrenheit 1280, 1MB	206.83
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	ORCHID Farhenheit VLB 1280 6 MB	219.32
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	PARADISE 1024/256K	135.20
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	PARADISE VGA	105.85
TM 4000 WIN DX25 200HD 4MB VGA	\$2397.90	H-P LaserJet 550C	3559.78	OMNI 600 LAN	348.69	VIDEO 7 Win VGA 1MB	129.74

**MOST ORDERS RECEIVED
BY 7:30 P.M. C.E.T.
SHIP SAME DAY**

**IF YOU FIND A BETTER PRICE CALL US BEFORE YOU BUY
2640 MARIA, NORTHBROOK, IL 60062 FAX (708) 291-1757**

**CDW® Carries Over 7000 Computer Products
At Discount Prices. If You Don't See It, Call!**

WHY WAIT? CALL COMPUTER DISCOUNT WAREHOUSE™ NOW!

CDW® EXTENDED HOURS
Call 1-800-451-4511 for more information
(Toll-Free 24 Hours a Day)

CDW

WE SELL NAME BRAND ITEMS FOR LESS!

(800) 326-4CDW

In Illinois FAX
(708) 564-4900 (708) 291-1737

Credit card charges are not
submitted until time of shipment

No Surcharge For Credit Cards

COMPUTER DISCOUNT WAREHOUSE™
SERVING YOUR PC NEEDS
SINCE 1982. DON'T ACCEPT ANY
IMITATIONS.

High Volume Bids Invited

©1993 CDW® Computer Centers, Inc.

Hitachi SuperScan 20 \$1479

Hitachi NSA's best value in a 20" monitor. An excellent choice for publishing, CAD/CAM, windowing, multimedia, and large screen business applications. Compatible with Standard and high refresh controllers including VGA, Super VGA, EVGA, XGA, 1024 x 768 and 1280 x 1024. The SuperScan 20 has a 31 dot pitch and an auto sync range of 30-64 KHz horizontal and 50-100 Hz vertical. UPS shippable.



Microsoft Money \$15

Easy data entry, personal or business expense tracking, quick and accurate reporting help you take control of your finances. Use it to write checks, set budgets, track expenses, or plan ahead. Money gives you fast and flexible ways to enter, report, and review your financial information. Price valid through 12/92



CA-Textor \$83

CA-Textor is a full-featured word processor that offers total word mastery with such advanced features as: dynamic user-defined dictionaries coupled with a complete spell checker and thesaurus (in American & British English and French languages), full editing capabilities in both preview and draft mode, an MDI interface which permits you to work on multiple documents simultaneously, embedded graphics, an advanced table editor, a unique calculation facility that enables you to perform up to 70 functions, and much more!



Microsoft SoundBits \$29.95

SoundBits makes the more fun by letting you play sounds with dozens of events in Windows. Get started right away using preconfigured sound schemes, or design your own sets of sounds and save them. Choose from three SoundBits: Hanna-Barbera Cartoons, Classic Hollywood Movies or Sounds Around the World.



Microsoft Office \$447

Microsoft Office for Windows includes the latest versions of four full-featured, easy-to-use applications for the Windows operating system. These leading applications are designed to work together to make it easier than ever for you to combine text, graphics, and data in great-looking documents. Applications include Word, Excel, PowerPoint and now mail.



FAST MICRO DIRECT EXPRESS

CD & MULTIMEDIA

Creative Labs Internal Multimedia Upgrade Kit \$559

Includes: Sound Blaster Pro stereo sound card, Creative Labs internal CD-ROM drive and a library of software (Microsoft Windows 3.1, Microsoft Bookshelf, Microsoft Works for Windows, MacroMind Action!, Authorware Star, Mathematica Tempora, & Sherlock Holmes).



CD-ROM Software	
Artshow by Corel	49
Baseball's Greatest Hit	49
Battle Chess	45
Carmen SanDiego	59
Sports Illustrated Almanac	39
Book of Mammals	49
Encyclopedia	59
MS Multimedia Beethoven	55
MS Multimedia Bookshelf	125
PC SIG Shareware CD	99
U.S. Atlas w/ AutoMap	69
World Atlas	49

Video Blaster \$319

The ultimate in video versatility for multimedia computing. Integrate video from a wide range of sources - video cameras, VCRs, TV - with your PC applications. Runs within Windows and lets you combine video with text & graphics.



CD-ROM Hardware	
NEC Ext. CD Express w/CDR25	419
Pinnacle Internal CD-Rom w/Atlas	349
Sony Int. CD Drive Kit	349
ATI Stereo F/X	109
Creative Labs Multimedia Kit CD-ROM & SB Pro	559
Sound Blaster	95
Sound Blaster Pro (stereo & MIDI)	179
Video Blaster	319
Media Vision ProAudio Spectrum Plus / 16	179/197

DRIVES

Colorado	
DJ-10 40-120mb Int. Tape	199
DJ-20 80-240mb Int. Tape	259
External Kit w/AB11	99
Trakler 120 mb / 250 mb	359 / 439
DTC	
6282-24 24mb/sec transfer rate	125
Metro	
7120A 120mb 15ms IDE	299
7213A 213mb 15ms IDE	399
Micropolis (see DTC Controllers)	
MC1664 345mb HH ESDI 14ms	899
MC1568 688mb FH ESDI 14ms	1279
MC1518 1.3gb FH ESDI 14ms	2139
Plus Development	
HardCard IXL 50mb 9 ms 16bit	249
HardCard IXL 105mb 9 ms 16bit	399

HARDWARE

DRIVES CONT.

Quantum LP552A 52mb 9ms IDE	199
LPS120A 120mb 9ms IDE	309
LPS240A 240mb 9ms IDE	579

Teac 1.44mb 3.5" or 5.25" Floppy Drive

Genuine Teac quality at a low price, these high density floppy drives also read write & format low density floppy disks. They work great with all true 286, 386 & 486 compatibles. 1.44 mb 3.5" drive includes mounting kit and bracket. For rails for 1.2mb 5.25" drive, add \$5.



Seagate	
40MB ST351A 28ms IDE Drive	159
105MB ST3120A 19ms IDE Drive	249
125MB ST3144A 19ms IDE Drive	299
245MB ST3283A 12ms IDE Drive	549
425MB ST1480A 14ms IDE	879
1.42GB ST41650N 15ms SCSI	1899

Teac	
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	59
Toshiba	
360K 5.25" Floppy (Black)	59
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	59
Western Digital	
WDAC280 80mb IDE 20ms	239
WDAC2200 200mb IDE 20ms	399

MODEMS

ATI	
2400 ETC V.42 Int. / Ext.	75/99
9600E External MNP V.42bis	279
Best Data Traveler 9624FP	109
Everex 2400B Int. Modem	65
Hayes	
Optima 24 + Fax96	149
Optima 96 + Fax96	369
Ultra 144 Ext.	669
Pocket Edition 2400 Modem	119
Intel	
Classic 2400 Modem Int./Ext.	139/159
Satstation Int. 100/200	99/299
Practical Peripherals	
2400B Int. Modem Sid/MNP	79/119
PM9600SA Int. / Ext.	279/299
PM14400FX Int. / Ext.	379/419
USRobotics	
9600 Sportster Int. / Ext.	399/449
Couner HST 14,400 Int. / Ext.	539/559
Couner HST 14,400 Dual Std. Ext.	799
ZOOM	
14.4 Int. / Ext.	265/295
2400b Internal Modem	59
9624 Send/Receive Int Fax Modem	79

Optima 9600 \$369

Hayes quality and affordability in this V.32 9600 bps modem. V.42bis boosts throughput to 38,400 bps. It also includes V.42 & MNP 5 error correction and automatic feature negotiation for the most efficient performance.



MICE & INPUT

Key Tronic 101 Keyboard	59
Logitech	
Mouseman Serial righthand	65
Mouseman Bus righthand	65
Mouseman Cordless	85
FotoMan	499
ScanMan 32	139
ScanMan 32 w/ Catchword	179
ScanMan 256	259
ScanMan 256 w/ Catchword Pro	299
Trackman 925	75
Trackman Portable	95
Microsoft	
Serial or Bus Mouse only	83
Serial with Windows	147
Ballpoint	119

Microsoft Mouse \$83

This mouse offers a resolution of 400 points per inch, unprecedented control and a greater degree of accuracy. There's an acceleration feature that moves you across the screen using only a few inches of desk space.



Feature that moves you across the screen using only a few inches of desk space.

Epson 3250 \$199

The Epson AP-3250 is the affordable, fully featured, narrow carriage, 24-pin dot matrix printer for small business and home use. It combines excellent high-resolution printing and paper handling and scalable fonts. Features include five built-in LQ type faces, two scalable fonts, built-in 50 sheet auto sheet feeder and an optional push tractor for precise forms handling.



NETWORKING

Artisoft/LanTastic	
LanTastic for Windows	115
LanTastic 2 Station Ethernet Kit	469
Ethernet Additional Stations	209
Eagle	
NE2000 2 Station NW Lite Kit	419
NE1500 16 Bit 10baseT Adapter	149
FastData NE2000 16 Bit 10-BaseT	109
Intel EtherExpress 16 or 16TP	129
Novell Netware Lite 11 w/ DR DOS	65

VIDEO & MONITORS

ATI	
Graphics Vantage 1mb	219
VGA Basic 16 / Integra	65/79
VGA Wonder XL24 1mb	149
Graphics Ultra Pro 1mb/2mb	449/529
Illimond	
SpeedStar24X 16 Million Colors	159
Stealth VRAM HColor 1mb	219
MAG Colorview 15 / 17x17	599/1099
Mitsubishi	
1410 EGA Monitor	249
Diamond Pro VGA 14	389
Diamond Scan 16L	919

FastData PowerWin VGA \$109

Run Windows six times faster than ordinary VGA! This 1mb VGA card features an ET4000 accelerator chip, maximum 1024x768 resolution, and standard 16 bit ISA compatibility. It also includes a S E C R A RAMDAC chip which allows it to display 65,536 colors at the 800x600 mode.



Hitachi	
SuperScan 15	599
SuperScan 17	1099
SuperScan 20	1479
Orchid	
ProDesigner II 1mb	199
Farenhet 1280s HColor	299
Panasonic C1381 SVGA	329
Radiologic Color Pwot w/ Card	1099
Seiko CM1450	439
Sony 1304S Multiscan	599
Video 7	
WIN.VGA 512K/1MB	139/169
V-RAM II Ergo VGA 1mb	299

CHIPS

Acculogic	
RAMPAT	119
RAMPAT Plus	145
Cyrix	
FasMath387DX 40	119
FasMath387SX	75
Intel 287XL	79
387-DX	85
387-SX	79
Overdrive486SX 25	499
Overdrive486DX 33	659
Memory - 1mb SIMMS 80ms	45

PRINTERS

Canon	
BJ10EX Portable	319
BJ3007 / BJ330 Ink Jet	459 / 599
Citizen	
200GX 9 Pin	159
GSX-130 24 Pin	219
GSX-140x 24 Pin	299
GSX-145 24 Pin Wide	369
PN48 Std / Pro	299/329
GSX-230	259
GSX-240	389
Co Star LabelWriter II/Plus	179/289
Epson Action 3250	199
Memory Products	
HP II, IIP, or III 1/2mb Upgrade	99/129
OKI 400 1/2mb Upgrade	129/169
Pana. 4420, 4450 1/2mb Upg.	119/169
NEC	
Silentwriter 2 Model 95	1449

Epson 3250 \$199

The Epson AP-3250 is the affordable, fully featured, narrow carriage, 24-pin dot matrix printer for small business and home use. It combines excellent high-resolution printing and paper handling and scalable fonts. Features include five built-in LQ type faces, two scalable fonts, built-in 50 sheet auto sheet feeder and an optional push tractor for precise forms handling.

Okidata	
Okiaser 400	599
Okidata ML 380	239
Panasonic	
KXP1180 9 Pin	149
KXP1123 24 Pin	199
KXP1124 High Speed 24 Pin	279
KXP1624 24 Pin Wide	339
KXP2180 Quiet 9 Pin	179
KXP2123 Quiet 24 Pin	259
KXP2124 Quiet 24 Pin	329
KXP21XX Series Color upgrade kit	59
KXP2624 High Speed Quiet 24 Pin	599
KXP4410.4430 Laser	649/899
KXP4450 Laser	1069
KXP4451 Laser	1449
KXP4455 Laser	1699

Panasonic 4410 Laser \$649

The Panasonic KX P 4410 includes 5 PPM, HP IIP emulation, a large 200 sheet paper tray and 28 standard fonts. It works with all current major software programs, has 512K of upgradable memory, and has an EZ-set LCD panel.

QMS PS410	1599
Seiko	
Smart Label Plus	139
Smart Label Plus Win & DOS	179
Star NX1001	139
Texas Instruments	
MicroLaser Plus PS17	1199
MicroLaser Plus PS35	1349
MicroLaser PS35 Turbo	1599

FASTDATA PRODUCTS

FastData Boards	
16bit 1mb VGA	69
16bit 256K VGA	45
2400B Internal Modem	49
9600B Send/Rec. Fax w/2400B	69
CGA Card	39
Ethernet 16bit 10Base-T	109
IDE 16 Bt Hard/Floppy Disk Cont.	23
IDE HD/FD w/Par/2 Senal/Game	23
MGP Card	29
Parallel/2 Senal/Game Card	29
RTL 16bit 1.1 Hard/Floppy Disk Cont.	69
XT 1.44 Dual Floppy Controller	35
FastData Monitors	
14" Amber or White TTL Mono	99
14" White VGA Mono	118
14" Super VGA 1024x768 28 dp.	299

FastData 2496 SR FaxModem \$69

A great value, the FastData 2400 baud internal modem with 9600 send and 4800 receive fax works with all industry standard PC's and includes BitFax software, and is configurable from COM 1 - COM 4.



FAST MICRO DIRECT EXPRESS

Ordering Information

- No Charge for Visa, MasterCard, Discover Card or American Express.
- Purchase orders accepted (no surcharges) from approved corporations only.
- Minimum phone order: \$50.
- Prices/availability subject to change.
- Sorry, no COD's.
- AZ orders add 6.7% tax.

Shipping Information

- All orders up to 20 pounds are shipped via Airborne Express.
- Shipping & handling charge: 3% (Min. \$6).
- AK, HI, & APO addresses add \$15 per box.
- Personal/company checks delay shipping.
- International orders: Fax 602-437-8622 for shipping costs before ordering.

Returns & Warranty Information

- Product warranties, offers & claims are handled by the manufacturer (all FastData branded products are warranted through FastMicro).
- Compatibility is not guaranteed (except on FastData products).
- No returns on used items (except FastData branded products).
- All opened returns are subject to 15% restocking fee (except FastData branded products).
- DOA's repaired or replaced at our option.
- Call for return authorization (RA) before returning product.
- Sorry, shipping is not refundable.



Mailing Address:

FastMicro, Inc.

4405 E. Baseline Road

Phoenix, AZ 85044

To place orders call:

For customer service call:

Canada/Local call:

800-441-3278

602-431-8100

602-431-8200

FAX:

602-431-8300



We Ship Air at Ground Rates.

CALL OUR TOLL-FREE ORDER LINE:

1-800-441-FAST

Microsoft Sound System

\$219

The Microsoft Windows Sound System lets you access the rich audio features of the windows operating system version 3.1, and adds many more integrated features of its own. Give your PC voice commands! Package contains software, audio card, microphone and headphones.



DATABASE & FORMS

askSam 5.1	209
Clanon Personal Developer	45
Clanon Professional Developer 3.0	449
Clipper 5.01	489
DataEase	509
dBase III+	439
dBase IV 1.5	479
w dBase for Windows	329
dBXL V	129
FormTool Gold	52
Formfiller	79
w FormWorx for Windows	99
Formbase Plus	229
FoxPro DOS - Windows	449/Call
Paradox 4.0	519
Paradox Version Upgrade	179
Paradox SE	65
PerForm Designer & Filler	89
w PerForm Pro	179
Personal Base	69
Q & A 4.0	249
Rbase 4.0	447
Reflex	159

Ami Pro 3.0

\$239

The unique, Windows-based design of Ami Pro 3.0 puts a world of creative power right at your fingertips. Create a frame for text or graphics. Copy and apply text attributes with Fast-Format. Print an envelope. Insert a picture. All it takes is click of the mouse.

Whether you create basic letters and memos or complex documents with charts and graphics, Ami Pro 3.0 will make your word processing work dramatically easier and your output better looking than ever. So you can create letter-perfect picture-perfect documents in half the time, with half the effort.



DESKTOP PUBLISHING

Bannermanie	21
Express Publisher DOS / Win	99/99
w Microsoft Publisher	129
w Pagemaker	489
w PFS: Publisher	86
PrintShop	33
PrintShop Deluxe	49
Publish It!	89
w Ventura Publisher for Windows	499
Ventura Database Publisher	179

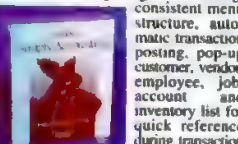
ENTERTAINMENT

AutoMap U.S.A./Europe	45/75
Chemistry Works	39
BodyWorks / Orbits	39/29
Cammen San Diego Deluxe Edition	45
F-19 Stealth Fighter	38
Falcon 3.0	45
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry V	39
w Microsoft Ent. Pack I, II or III	27
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	47
w Microsoft Golf	27
PC Globe or PC USA	35
Science Adventure	53
Sports Adventure	41
Smitty or Smitty for Windows	28
w SimEarth or SimEarth for Windows	39

FINANCIAL

Simply Accounting \$119

Simply Accounting for Windows includes everything you need to get up and running in a flash: A general ledger, accounts receivable, accounts payable, payroll, inventory control and job costing. All functions are fully integrated including: consistent menu structure, automatic transaction posting, pop-up customer, vendor, employee, job, account, and inventory list for quick reference during transaction entry.



SOFTWARE

w = Windows Software

FINANCIAL CONT.

ACCPAC BPI Value Pak	359
ACCPAC Simply Accounting DOS	119
w ACCPAC Simply Accounting Windows	119
DAC Accounting 4.3	85
DAC Bonus Pack 4.3	119
DAC Easy Instant Accounting	35
Managing Your Money	47
w Microsoft Money for Windows	15
w M Y O B	129
One Write Plus GL, AP & AR	79
Pacioli 2000	29
Peachtree Basic Acctg	69
PeachPay	49
w Peachtree Acctg. for Windows	89
Peachtree Complete 6.0 (with DQ)	169
Peachtree Network Accounting	279
w Quickwin for Windows	41
Quicken DOS 6.0	41
QuickBooks	85
QuickBooks with QuickPay	109
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	89

GRAPHICS

w Adobe Illustrator 4.0	359
Autosketch 3.0 DOS/Windows	139/169
w Corel Draw 3.0	369
Design Cad 3-D	235
DrawPerfect	259
w Freehand	389
Freelance Graphics 4.0	299
w Freelance Graphics for Windows	299
Freelance Competitive Upgrade	89

PROGRAMMING CONT.

MS Quick Basic	60
MS Quick C DOS	60
w MS Quick C Windows	120
MS Quick Pascal	60
Turbo C++ DOS	69
w Turbo C++ Windows	99
Turbo Pascal DOS	99
w Turbo Pascal for Windows	119
w Visual Basic for Windows	125

SPREADSHEETS

1-2-3 version 2.4	325
1-2-3 version 3.1+	399
w 1-2-3 for Windows 1.1	319
w 1-2-3 Competitive Upgrades	99ea

QuattroPro for Windows \$299



Now you can get Borland's Quattro Pro for Windows and Quattro Pro for DOS together for the price of one! Built with Borland's innovative object-oriented technology, Quattro Pro for Windows is packed with revolutionary new features, including Spreadsheet Notebooks to manage and organize your work.

Always	115
w Excel 4.0	299
w Excel 4.0 Competitive Upgrade	119
w Quattro Pro WinDOS	299
w Quattro Pro WinDOS Upgrade	139
Quattro Pro SE	45
w Quattro Pro Windows Upgrade	89
Supercalc 5.5	89

WORD PROCESSORS

w Ami Pro 3.0	239
w Ami Pro 3.0 Comp./Vers. Upgr.	95/65
w CA-Textor	83
w Correct Grammar	57
Facsimile for WordPerfect	57
w Grammarik IV for Windows	55
Grammarik V	55
w JustWrite 2.0	159
LetterPerfect	85

WordPerfect for Windows \$249



The #1 Word Processor for Windows! WordPerfect 5.1 for Windows is simple, powerful, and fun to use. WPW includes customizable ButtonBar™, Dynamic Data Exchange, full graphical integration, Upgrade from WP for DOS for \$79

w WordPerfect for Windows	249
Microsoft Word for DOS	209
w Microsoft Word for Windows	299
w Pro Write Plus	159
Multimate 4.0	239
PC Write Standard Level	59
Professional Write	159
RightWriter DOS 6.0	59
w RightWriter for Windows	59
WordPerfect 5.1	249
w WordPerfect for Windows	249
w WordPerfect DOS to Win. Upgrade	79
WordPerfect Add'l Station License	159
WordPerfect Office	89
w WordStar for Windows	89
WordStar Pro	259
Writer's Toolkit DOS/Windows	79/79

UTILITIES - DOS

386 MAX	59
Address Book Plus	59
Calendar Creator Plus	39
Carbon Copy Plus	125
Central Point Anti-Virus	89
Central Point Backup	89
CheckIt	79
Compuserve Membership	29
Desqview 2.4	75
Desqview 386 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36/119
Disk Optimizer	29

UTILITIES - DOS CONT

DR DOS 6.0	65
DosFax Pro	49
Fastback Plus	119
Hijack	125
InfoSpotter	45
Labels Unlimited	59
Laplink Pro	95
Laplink Pro 4.0 Version Upgrade	56
Microsoft Learning DOS	32
MS-DOS 5.0 Upgrade	55
Norton AntiVirus	79
Norton Backup	85
Norton Desktop for DOS	109
Norton Utilities	109
OS/2	139
PC Anywhere IV	109
PC Tools Deluxe 8.0	119
P.D. Queue	55
Pop Drop Plus	53
PrintRite	19
ProComm Plus	65
Prodigy	25
QA Plus	85
OEMM 386 6.0	57
QRAM 2.0	49
SideKick 2.0	59
Sideways	55
Smartcom Exec	69
SprintRite II	69
Stacker	89
Stacker AT16	179
Super PC Kwik	55
XTree Gold 2.5	89

UTILITIES - WINDOWS

Wired for Sound Pro \$39



This Windows utility for your sound card has 200 realistic sounds. Add personality by attaching sounds and voices to any Windows application, message, icon, or dialog box. The Talking Alarm Clock and Talking Calendar tell you where to be and when to see. You also get 400 ICONS that talk, 100 cursors, Talking Calculator, Talking Solitaire, Minesweeper, 10 video screen savers, and four other great programs. For sound without hardware ask for Wired for Sound 2.0. Call 800-551-4547 for a live demo then call FastMicro to order.

w Adobe Type Sets	Call
w Adobe Type Align	59
w Adobe Type Manager	59
w Adobe Type Manager Plus Pack	115
w After Dark for Windows	25
w BeckerTools	37
w Bitstream MakeUp	89
w BitFax & BitCom	89
w CA-Up To Date	89
w CA-SuperProject for Windows	539
w Direct Access Windows	60
w Hijack	125
w Lotus Organizer	89
w MicroPhone II	89
w Microsoft Mouse w/ Windows 3.1	147
w Microsoft Productivity Pack	39
w Microsoft Project for Windows	429
w Microsoft TrueType Font Pack	39
w Microsoft Windows 3.1	89
w MediaBlitz	69
w Multimedia Make Your Point	73
w Norton Backup	85
w Norton Desktop	109
w On Target	239
w PackRat 4.1	239
w ProComm Plus for Windows	85
w WideAngle for Windows	59
w Winconnect	59
w WinFax Pro	69
w XTree	Call



Novell Network v3.11

Network network software allows you to share software, data files, printers and more. Support DOS, Windows and OS/2 work stations, connect printers, modems and faxes, and automatically back up your data every night. Works with any network card including Token Ring, Arcnet and FastData Ethernet card.

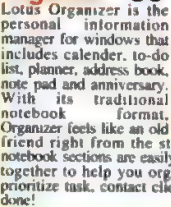
Network v3.11 5 User	\$ 579
Network v3.11 10 User	\$1279
Network v3.11 20 User	\$1749

Microsoft Access \$89



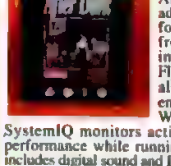
Microsoft Access is the relational database management system for the Windows operating system. Access data quickly using graphical query-by-example. Includes an integrated development environment with a full suite of debugging tools. Read and write foreign desktop data concurrently, including dBase III PLUS & dBase IV, Paradox 3.0 & 3.5 and Btrieve formats.

Lotus Organizer \$89



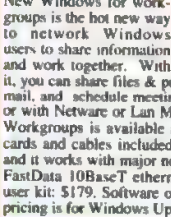
Lotus Organizer is the personal information manager for windows that includes calendar, to-do list, planner, address book, note pad and anniversary. With its traditional notebook format, Organizer feels like an old friend right from the start. The six tabbed notebook sections are easily customized and work together to help you organize your schedule, prioritize task, contact clients and just get more done!

After Dark 2.0 \$25



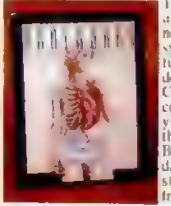
After Dark is the most advanced screen saver for Windows. Choose from over 40 savers, including the famous Flying Toasters. You can also password protect entry to Windows with Windows Shutter. SystemIQ monitors activity and maximizes performance while running After Dark. Also includes digital sound and DOS blanking.

Windows for Workgroups \$359 2 User Kit



New Windows for workgroups is the hot new way to network Windows users to share information and work together. With it, you can share files & printers, send & receive mail, and schedule meetings. It works by itself or with Netware or Lan Manager. Windows for Workgroups is available as a kit with network cards and cables included or as software alone and it works with major network cards (incl. our FastData 10BaseT ethernet card). Additional user kit: \$179. Software only \$65 per user. All pricing is for Windows Upgrade Versions.

BodyWorks \$39



The human body is the ultimate machine, and now you can explore its systems, structures and functions in fascinating detail with BodyWorks. Colorful comprehensive computer graphics guide you on a journey through the body. BodyWorks' vast database allows you to study specific areas from head to toe.

Arlington Computer Products... Great Prices and Service Since 1984!

- PC Magazine "...Arlington offers worry-free mail order purchasing!"
- PC Sources Product Review "...You can be confident that what you order will work as soon as it arrives!"
- PC Computing Phantom Shopper "...Courteous service and terrific technical support!"

HEWLETT-PACKARD

Laserjet III w/Toner	\$1499
Laserjet IV w/Toner	\$1419
Laserjet IIP+ w/Toner	\$809
Laserjet IIIP w/Toner	\$979
Laserjet III Si w/Toner	\$3249
1MG Upgrade	\$69
2MG Upgrade	\$99
4MG Upgrade	\$159
Deskjet 500/500C	\$399/519
Deskjet 550C	\$729
Pacific Page/XL	\$269/\$629
Pacific Data 25 in 1 Font	\$249

Panasonic

1123 ..	\$195	2624 ..	\$359
11241 ..	\$275	4410 ..	\$599
2123 ..	\$229	4430 ..	\$859
2124 ..	\$299	4450I ..	\$1059
2180 ..	\$179	4451 ..	\$1379
1624 ..	\$329	4455 ..	\$1679
4410/4450I 2 MG...	\$129		
CITIZEN			
GS230	\$249	GS145	\$369
GS240	\$299	PN 48	\$295

Canon

BJ-10EX	\$279
BJ-20EX	\$365
BJ-200	\$329
BJ-300	\$339
BJ-300 Cart.	\$19
BJ-330	\$555
BJC-800	\$1779
BJC-820	\$1929
LBP-45X	\$889
LBP-85X	\$1289



BJ-200

EPSON PRINTERS

LX810	\$169	FX1170	\$389	LQ1070	\$369	EPL 8000	\$1069
FX870	\$289	LQ570	\$259	LQ1170	\$569	DFX5000	\$1269
FX1050	\$349	LQ870	\$425	LQ2550	\$849	DFX8000	\$2139

NO SURCHARGE FOR CHARGE CARDS!

OKIDATA

ML320 ..	\$309	3410 ..	\$1229
ML321 ..	\$419	OL400 ..	\$589
ML380 ..	\$219	OL810 ..	\$1049
ML590 ..	\$425	OL820 ..	\$1219
ML591 ..	\$579	OL830 ..	\$1279
ML393 ..	\$909	OL840 ..	\$1559
OL400 2MB ..	\$129		

TEXAS INST.

TM 3000/WINSX 60	\$1749
TM 4000/WINSX 80	\$2149
TM 4000/WINSX 120	\$2349
LASER PS17	\$1179
LASER PS35	\$1299
LASER PS35 Turbo	\$1499

NETWORKING

Netware 2.2 5 User	\$499
Netware 2.2 10 User	\$1099
Netware 3.11 5 User	\$589
Netware 3.11 10 User	\$1359
Netware 3.11 50 User	\$2699
Lantastic 10BPS Starter	\$449
E143 Ethernet	\$199
NE1000 Ethernet	\$99
NE2000	\$139
Ethercard +/-16	\$119/\$139
3 Com EtherLink II	\$185
3 Com EtherCard	\$279
Intel Ether 16	\$119
Intel Ether 16-20 Pack	\$1975
Irma Board 3	\$399

SCAN. & DIGIT.

Epson 600C	\$799
Houston Inst. DMD-161	\$2775
Houston Inst. DMD-162	\$3549
Logitech ScanMan	\$135
Logitech ScanMan 256	\$259
Mustek Gray Artist	\$159
Mustek Color Artist	\$299
Summasketch 12x12	\$269
Summasketch 12x18	\$479

NEC

P3200/3300	\$225/\$325
P6200/6300	\$399/\$599
P9300	\$825
Model 95 Pscrt Laser	\$1379
Model 990 Pscrt Laser	\$1475

MONITORS



NEC

3 FGX	\$619
4 FG	\$729
5 FG	\$1245
6 FG	\$2249

MITSUBISHI

EGA	\$239
Diamond Scan 4533C	\$449
Diamond Pro 17	\$1099
HL6955 20"	\$1779

PANASONIC

1381 VGA 1024x768	\$319
1395 VGA 1024x768	\$429
1991 VGA 1280x1024	\$1539

SAMSUNG

14" Sync Master 2	\$249
15" Sync Master 15	\$479
17" Sync Master 4	\$769

VIDEO BOARDS

ATI VGA Wonder 1MG	\$149
ATI VGA Stereo	\$199
ATI Graph Ultra 1MG	\$279
ATI Graph Ultra +	\$299
ATI Graph Prof 2 MG	\$499
Sound Blaster Prof	\$179
1024 VGA 16 Bit	\$79

MODEMS

Hayes 2400 Optima	\$129
Hayes Optima 96	\$329
Hayes Optima 14.4	\$399
Hayes Optima 14.4/Fax	\$439
Hayes Ultra 96	\$549
Hayes Ultra 14.4	\$589
Intel 2400 Ext. V.42	\$149
Practical Per. 2400 Int.	\$69
Practical Per. 2400 Ext.	\$99
Practical Per. 9600 Int.	\$199
Practical Per. 9600 Ext.	\$229
Practical Per. 14.4 Int.	\$329
Practical Per. 14.4	\$355
US Robotics 9600	\$539
US Robotics Dual Std	\$729
US Sportster 14.4 Ext.	\$309
US Sportster 14.4 Fax	\$329

int'l

SatisFAXtion MODEMS

100 2400/9600 Fax	\$99
200 2400 V.42/9600 Fax	\$275
400 14.4/14.4 Fax	\$375
400 Ext 14.4/14.4 Fax	\$419
Faxability Plus	\$69
Faxability Plus/OCR	\$159

CHIPS

256K/1 MG Chips each	\$3/\$6
256K/1MB Simms	\$15/\$39
4MB Simms	\$139
Compaq 386 4 MB	\$219
Compaq LTE 386 4MB	\$239
HP 2MG Upgrade	\$99
IBM 70 & 80 2 MB	\$109
Intel ISA 2 MB	\$299
OKI Laser 2MB	\$139

int'l

80287-10XL/XLT	\$79
80387 SX-16/20/25	\$75
80387-16/20/25/33	\$85
RapidCAD	\$249
Overdrive SX20/25	\$349/\$469
Overdrive DX25/33	\$459/\$609
Snap-In 386	\$329

SOFTWARE

Aldus Pagemaker	\$489
Corel Draw	\$369
Lotus 123 2.4/3.1	\$329/\$389
Lotus 123 2.4 Server	\$559
Lotus Server Node	\$335
Microsoft Excel Wndws	\$299
Microsoft Windows 3.1	\$79
Microsoft DOS 5.0	\$79
PC Tools 7.1	\$99
Word Perfect 5.1	\$259
Word Perfect Windows	\$269

DRIVES & TAPES

Ext. 1.2 for PSII	\$159
Toshiba 3 1/2" 1.44	\$69
Colorado Jumbo 120	\$189
Colorado Jumbo 250	\$249
Colorado Tracker 120	\$339
Colorado Tracker 250	\$399
Colorado QFA 700	\$695
Iomega 250	\$249
Irwin 120/250	\$189/\$249

AMERICAN UPS

250	\$109	600	\$259
400	\$165	900	\$375
450	\$199	1200VX	\$729

CD ROM OPTICAL DISKS

NEC CDR-74 Gallery	\$629
NEC CD Express	\$409

SEAGATE HARD DISKS

40 MB for AT (ST251-1)	\$239
80 MB for AT (4096)	\$349
89 MG 3096	\$269
106 MG 3120A	\$249
120 MG 3144A	\$279
245 MG 3283	\$499

PLUS HARD CARD

40 MB/50 XL	\$299/\$239
105 MB/240 MB	\$319/\$559

CONNOR HARD DRIVES

40 MB	\$189
120 MB	\$279
209 MB/540 MB	\$459/\$939

**Arlington
Computer
Products, Inc.**

1775 CARBOY
MT. PROSPECT, N. HAMPSHIRE

FOR CATALOG & QUOTES

800-548-5105

CUSTOMER SERVICE AND INQUIRY 708-228-6333

SHIPPING 708-228-9748

TECHNICAL ASSISTANCE 708-228-1476

We Export 714 708-228-0515

COMPUCLASSICS

YOUR SOURCE FOR SOFTWARE

FREE GROUND SHIPPING

- Over 9 Years Serving You
- Overnight Shipping Available
- 24-Hour FAX Order Line
- Int'l, APO, FPO, Gov't and Educational Orders & POs Accepted
- Visa, MasterCard, Amex & Discover (No Surcharge on U.S. Orders)
- Over 10,000 Titles Available
- Corporate POs Welcome
- No Minimum on Individual Orders

ACCOUNTING		MULTIMEDIA/CD ROM	
Managing Your Money 9.0	52	Grail's New Electronic Encyclopedia	229
Pacheco's Complete 6.0	189	Just Grandma & Me	30
Quickbooks	80	Multimedia Upgrade Kit Plus Internal	779
QuickBooks 6.0	44	Pro Audio Spectrum 16	229
MYOB Accounting for Wind 3.0	165	Sound Blaster 16	250
CAD		Sound Blaster Professional	190
AutoSketch for DOS	140	Sound Blaster Pro Multimed Upg Kit Int	470
Design Cad 2D 5.0	179	Sound Blaster Speakers	30
Design Cad 3D 4.0	250	Autodesk Multimedia Explorer	125
Genesis: Cad 6.0	289	MS Camstudio	50
Drafts Cad for Windows 2.1	429	MS Multimedia Bookshelf for Win	135
COMMUNICATIONS		Etherlink III	140
Carbon Copy 8.1	145	Lantronic AE-2 Ethernet Adapter 4.1	215
DOS FaxPro 2.0	179	NE 2000 18-Int w/a Cable	189
Hoyes Opera 144	475	Novell Netware	CALL
Intel Setpoint 400 Int.	439	PCI210B2 (New Tractor)	289
LogiLink Pro 4.0	105	OPERATING ENVIRONMENTS	
PC Anywhere (Host & Remote) 4.5	119	Demomaker 7X	175
QuickCall 24 Internet	39	IBM OS/2 2.0	142
QuickCall 4 Plus 4.2	299	HP New Wave 4.1	108
Telenet Office Modem 9800	299	MS Win 3.1 & DOS 5.0 Upg	145
Workport 2496 Fax/Modem V.42	105	PERSONAL INFORMATION	
Zoom S/R Fax Modem Int	105	Autosnap	54
ProComm Plus DOS/Win	74/105	Autosnap Europe	79
CC Mail Wind Plot Pack 1.11	359	Dr. Schuster's Home Medical Advisor	90
Close Up Support/Cust Win 4.0	129	Infocontact 2.0	90
CrossTalk Windows 1.2	119	Autosnap for Windows	62
Reflection 2 Windows	239	Infocontact 2.0	97
Writer Pro 3.0	82	Packet 4.1	245
DATABASES		Star Trek Screen Saver	36
Alpha/Free Comprehensive Upgrade 2.0	95	PROJECT MANAGEMENT	
Bimbar 2.0	249	Project Scheduler V.1.5	450
Copper 5.0.1	489	MS Project for Windows 3.0	455
Codewave 4.5	249	Timeline for Windows	409
DBase IV 1.5	499	SPREADSHEETS	
Fuqpa LAN 8 Pack 2.0	599	Lotus 1-2-3 3.1+	399
Fuqpa Single User 2.0	519	Lotus 1-2-3 2.4	339
Fancy Lib II	469	Quattro Pro Comp Upgrade 4.0	97
R & R Relat. Report Writer Xbase 5.0	175	Quattro Pro Wind/DOS	309
DESKTOP PUBLISHING		Lotus 1-2-3 Windows 1.1	335
NewsForm 3.0.1	75	Lotus 1-2-3 Win Comp Upgr 1.1	105
Scanman 258	282	MS Excel for Win Comp Upgr 4.0	127
Uniscrypt PC 3.0	112	STATISTICS/SCIENTIFIC	
By Design	50	Biomaker 2.5	142
Veritas Publisher DOS/Win	529	CSS: Statistics	935
Adobe Type Manager for Wind 2.0	84	Derive 2.5	135
Adobe Publishing Showcase	699	Grapher	145
OmniPage Professional 2.1	649	MedCalc 2.5	325
Pagemaker 4.0	499	Mathematics 386 w/387 Supp 2.1	749
ENTERTAINMENT/EDUCATION		SPSS PC Base Module 5.0	199
Barba Design Studio	25	SPSS PC Plus Adv Stats 5.0	300
Bodyworks: Adventure in Anatomy	45		
Design Your Own Railroad	42		

Simply Business Bundle



All the software a small business will ever need. CA-Simply Business Bundle for Windows combines a full-fledged Accounting System including Payroll & Inventory, a powerful word processor that offers complete

page layout & graphics, a multi-dimensional spreadsheet, a personal & group schedule that will manage your time & your staff's more efficiently. Visual presentation software to create beautiful newsletters & a free CompuServe Information Manager.

\$429

Spanish Assistant 5.0



Spanish Assistant, French Assistant, German Assistant and Italian Assistant give you sentence-by-sentence translation in both directions—from English to the foreign language.

and vice-versa! Powerful reference and writing tools are also included.

\$59

BitFax/OCR



BitFax/OCR for Windows is integrated with character recognition from Caere, and BitCom. Receive in background, broadcast, schedule, and easy to use icon-based user interface.

BitFax 4.0 for DOS is totally redesigned with data & voice recognition, hot keys, background & broadcast faxing, plain paper printing, and dBase compatible phone book.

BitFax/OCR for Windows **\$75** BitFax 4.0 for DOS **\$35**

We have over 250 CD-ROM titles.

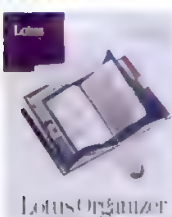
COMPUCLASSICS

P.O. Box 10598, Canoga Park, CA 91309
Showroom: 7959 Deering Ave., Canoga Park, CA 91304
CALL US FOR PRODUCTS NOT LISTED
PLEASE SPECIFY DISK SIZE WHEN ORDERING
Air shipping charges \$7.00 per order, up to 7 lbs. \$1.00 per pound above 7 lbs. only in the Continental United States. Defective software will be replaced immediately. Your credit card will not be charged until your order is shipped. We ship latest versions. Delivery guarantee only applies to in-stock items. Alaska, Hawaii, Puerto Rico, Int'l, FPO/APO call for shipping charges. 15% restocking fee on non-defective items. Prices subject to change without notice. We accept VISA, MasterCard, Discover, JCB and American Express. Please call (818) 347-9400 for an authorization number on returns. \$5.00 C.O.D. charge. Order desk open 7 am to 5 pm Monday through Friday (PST). Saturday 10 am to 2 pm. 24-Hour FAX Order-Line.

■ Indicates Windows Products
■ Indicates DOS/Windows Products

PCM 1/93

Lotus Organizer



Lotus Organizer for Windows is an on-screen calendar, to-do list, planner, address book, notepad and anniversary reminder all rolled into one. It looks and works like the book you may already use to manage

your schedule, business contacts and work flows. It's the fun, easy way to turn your current organizer into a powerful productivity tool.

\$105

R:BASE 4.0 for DOS



The first PC-based, true 32-bit, relational database management system (DBMS), which takes advantage of the speed and memory capabilities of the Intel386™ and Intel486™ processors. New features

include: ANSI Level II SQL, interactive debugger, row-level locking and intuitive, pull-down menus. A 16-bit 80286 version is included in the package.

\$499

800-735-1993/818-347-7500/FAX 818-347-9977

CIRCLE 205 ON READER SERVICE CARD

COMPAQ

IF YOU'RE BUYING COMPAQ, BUY SMART. BUY DIRECT. BUY PCs COMPLEAT.

✓ DOES COMPAQ TOP YOUR SYSTEMS SHOPPING LIST?

Put PCs Compleat up there too. Because we now sell – direct – a full line of COMPAQ computers. From high-performance COMPAQ notebooks and small office machines to powerful custom-configured systems. All with the same compleat service and guaranteed lowest prices you've come to expect from us.

✓ THE MOST COMPLEAT VALUE WITH GUARANTEED LOWEST PRICES.

PCs Compleat offers you the guaranteed lowest price for COMPAQ systems. In fact, if you find a readily-available system at a lower price from a COMPAQ-authorized supplier within 30 days of your purchase, we'll promptly refund the difference.

✓ DEDICATED COMPAQ SALES CONSULTANTS AND TOLL-FREE HOTLINE.

We don't just sell COMPAQ, we know COMPAQ! Our COMPAQ-dedicated sales consultants are COMPAQ-trained and COMPAQ-knowledgeable. They know everything about COMPAQ that you need to know. And when you call 1-800-377-4727, they'll put their knowledge to work for you to ensure that you get what you need.

✓ CALL OUR COMPAQ HOTLINE TODAY... HAVE YOUR COMPAQ TOMORROW.

Place your order for a standard in-stock configuration by 4:00 p.m. EST, Monday through Friday, and we'll have you up and running on your new COMPAQ system the next morning, using overnight delivery.* In fact, we guarantee to ship the same day, or we'll pay your shipping and insurance charges! For custom-configured COMPAQs, we'll build and ship your order within 48 hours.

✓ LIFETIME, TOLL-FREE SUPPORT.

PCs Compleat is there with toll-free, technical support for the life of your COMPAQ. At no additional cost. Our on-line database puts customer service information at our expert technicians' fingertips, so most of your questions can be answered in one toll-free call.

✓ AND COMPLEAT ON-SITE SERVICE.

Your PCs Compleat COMPAQ comes with the full manufacturer's warranty, including CompaqCare on-site service. Under your warranty, if we cannot fix your problem over the phone, we'll contact a local, authorized technician to correct the problem at your site – free of charge.

✓ BUY DIRECT – RISK-FREE.

How? With our 30-day unconditional, money-back guarantee. If you're not completely satisfied with any PC system you purchase from PC Compleat – for any reason – within 30 days, we'll promptly replace it or refund your money. And there's no restocking fee.

ABOUT PCs COMPLEAT

This unique PC source was founded by the same people who built Microamerica into a \$526 million PC distribution company. The mission of PCs Compleat is simple: to give customers the brand name choices of a superstore, the value and convenience of a traditional direct seller, with service and support neither can match.

"Score one for truth in advertising... (PCs Compleat) stands behind what it sells."

PCs COMPLEAT. WHY SHOP AROUND ANYMORE?

* Overnight delivery costs are slightly higher than other delivery options.

**WE WON'T ACCEPT
ANYTHING LESS THAN
YOUR COMPLEAT
SATISFACTION. SO WHY
SHOULD YOU?**

At PCs Compleat, system selection, purchase, and delivery are fast and efficient. Our order entry system knows the COMPAQ-compatible options, peripherals, and accessories necessary to build your custom-configured system.

So, minutes after your phone order is entered, we have the compleat list of items and instructions to build your COMPAQ, load your software, test and ship. When your COMPAQ arrives, you simply plug and play.

**PCs COMPLEAT HAS
WHAT YOU NEED. BRAND
NAMES AT THE LOWEST
PRICE-DIRECT.**

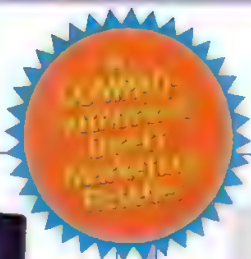
We've added this outstanding line of COMPAQs to the over 1,000 brand name systems, software, and peripherals we already stock. That means no more long lead times or backorders. Just fast, same-day service and shipping.

Of course, we'll also custom configure to your specifications. And if you're not sure what they are - but you know what you need to get done - we can even help you spec the system that's just right for your needs and budget. All at no cost to you.

**WE EVEN MAKE IT EASY
TO PAY...**



You can pay for your order with most major credit cards. We add no surcharges, and your card is not charged until your order is shipped. We also accept company or personal checks, money orders, wire transfers, CODs, APOs, FPOs, and purchase orders.



Contura 25MHz 386SL

- 4MB RAM, expandable to 12MB
- 64KB cache
- 120MB hard drive
- Weight 6.2lbs
- MS DOS 5.0, Windows 3.1, PFS: Window Works
- Compaq trackball

Call for pricing on other models

\$2149

Lease for \$78.86/month



Contura 25MHz 386SL Color

- 4MB RAM, expandable to 12MB
- 64KB cache
- 84MB hard drive
- Weight 6.7lbs
- MS DOS 5.0, Windows 3.1
- Compaq trackball

\$2449

- 120MB hard drive configuration

\$2739

Call for pricing on other models

\$2449

Lease for \$89.89/month



LTE Lite 25MHz 386SL Color

- 4MB RAM, expandable to 20MB
- 64KB cache, 84MB hard drive
- Active matrix color display
- Weight 6.5lbs
- MS DOS 5.0, Windows 3.1
- Built-in trackball

\$3399

- 120MB configuration

\$3699

Call for pricing on other models

\$3399

Lease for \$124.77/month



Proliner 25MHz 386SX

- 2MB RAM, expandable to 16MB
- 64KB cache
- 84MB hard drive
- 1.44MB 3.5" floppy drive
- 1024x768 graphics controller
- MS DOS 5.0, Windows 3.1
- Compaq mouse

Monitor priced separately
Call for pricing on other models

\$939

Lease for \$50/month

**90 DAYS FREE FINANCING
TO QUALIFIED INDIVIDUALS!**

PCs Compleat can also extend to you a new and unique line of credit, the PCs Compleat Technology Card. You can use your Technology Card like any credit card for all of your PCs Compleat purchases, and there's no application fee and no annual fee.

**INTRODUCE YOURSELF
TO THE PCs COMPLEAT
TECHNOLOGY CARD
WITH OUR 90 DAYS
FREE FINANCING
OFFER!!**

For a limited time, as a special get-acquainted offer, any PCs Compleat purchase you charge to your Technology Card and pay in full within 90 days of the purchase, will be interest-free. Limited time offer.



**AND OUR LOW-COST
LEASING PLAN FOR
QUALIFIED BUSINESSES.**

PCs Compleat also extends a low-cost leasing option with 100% financing for up to 60 months. All costs are covered - including software, peripherals, and accessories. Talk with a PCs Compleat consultant today for compleat details.

CORPORATE CUSTOMERS.

Ask about our Volume Purchase Agreements (VPA) and Asset Tagging Program.

PCs COMPLEAT

Real Service • Unreal Prices

1-800-377-4727

CALL THE PCs COMPLEAT COMPAQ HOTLINE

CIRCLE 092 ON READER SERVICE CARD

HOURS:
Mon.-Fri. 9 a.m.-9 p.m. EST
Sat. 10 a.m.-6 p.m. EST
Sun. 12 p.m.-6 p.m. EST
24-HOUR FAX ORDERS:
1-800-669-8329
INTERNATIONAL CALLS:
1-508-624-6400

PCM-1/93-COM

©PCs COMPLEAT. 495 Technology Center West, 34 St. Martin Drive, Marlborough, MA 01752. All prices are subject to change and do not include shipping. COMPAQ is a trademark of Compaq Computer Corporation.

GUARANTEED LOWEST PC PRICES • BRAND NAMES YOU TRUST • IMMEDIATE AVAILABILITY • UNMATCHED SERVICE

The most complete PC value, with guaranteed lowest prices.

PCs Compleat offers you low PC prices we guarantee nobody can beat. But what makes us totally unique is the brand selection, service and support you receive. From custom configured "plug and play" systems and overnight delivery to flexible leasing plans and free lifetime technical support, we're the most complete PC source ever.

GUARANTEED LOWEST PRICE ON EVERY PC.

You always get the lowest available price on PCs Compleat systems. In fact, if you find a readily available system at a lower price from any authorized supplier within 30 days of your purchase, we'll promptly refund the difference.

SYSTEMS CONFIGURED WITH EVERYTHING YOU NEED.

Let PCs Compleat put your entire system together and eliminate installation hassles. Our technicians will install your application software for free. We'll also install extra memory, network cards, peripherals—even configure your printer driver—at no charge. Just take your PC out of the box, plug it in, and go to work!

GUARANTEED OVERNIGHT DELIVERY AVAILABLE ON OVER 50 STANDARD SYSTEMS.

PCs Compleat can have you up and running on your new system by tomorrow morning, using overnight delivery.* If your order for a standard, in-stock configuration is received by 4:00 p.m. EST Monday through Friday, we guarantee to ship it that day—or we'll pay your delivery and insurance charges.

30-DAY RISK-FREE GUARANTEE.

You must be completely satisfied with your PCs Compleat system. If not, simply return it within 30 days of purchase, and we'll promptly replace it or give you a full refund. Your choice.

90 DAYS FREE FINANCING TO QUALIFIED INDIVIDUALS

PCs Compleat can also extend to you a new and unique line of credit, the PCs Compleat Technology Card. You can use your Technology Card for all your PCs Compleat purchases, and there's no application fee and no annual fee. And for a limited time, as a special get acquainted offer, any PCs Compleat purchase you charge to your Technology Card and pay in full within 90 days of the purchase will be interest-free.



*Overnight delivery costs slightly more than other delivery options.

PCs COMPLEAT



OVER 1,000 BRAND NAME PRODUCTS.

Through PCs Compleat, you get more than a huge selection of PCs, peripherals and software at super low prices. You get the peace of mind that comes with products from companies like AST, Toshiba, Texas Instruments, and NEC. You can rest easy knowing your system contains first-rate components.

48-HOUR DELIVERY ON CUSTOM CONFIGURATIONS.

Using PCs Compleat's state-of-the-art order entry system and overnight delivery—most custom configured systems are delivered to your door within 48 hours.

FREE LIFETIME TOLL-FREE TECHNICAL SUPPORT.

After your system arrives, PCs Compleat's professionals are ready to assist you with any technical issues. Most technical questions can be answered in just one toll-free call. This free technical support is available for as long as you own your PCs Compleat system.

FREE ON-SITE SERVICE.

Every PCs Compleat system comes with the manufacturer's full warranty, including on-site service (when applicable). Under the warranty, if you have a problem PCs Compleat can't fix over the phone, we'll immediately dispatch a technician to your office—at no charge.

LOW-COST LEASING PLANS.

With PCs Compleat, approved accounts have the option of leasing with 100% financing for up to 60 months. Leasing covers all equipment costs, including peripherals, software, and accessories. Terms are very reasonable. Phone for complete details.

IT'S EASY TO ORDER.

Call PCs Compleat for a free consultation, or to order. You can also fax your order, toll-free, 24 hours a day. We welcome most major credit cards, approved company or personal checks, money orders, wire transfers, CODs, APOs, FPOs, purchase orders—and leases. Corporate customers—ask about our Asset Tagging Program and Volume Purchase Agreement (VPA).

ABOUT PCS COMPLEAT.

PCs Compleat was founded by the people who built Microamerica into a \$526 million PC distribution company. Our mission is to give you the brand choices of a superstore, the value and convenience of a traditional direct seller, with service and support neither can match.

COMPAQ products now available

Call for pricing.



COMPAQ

- Prolinea 25MHz 386SX
 - 2MB RAM, expandable to 16MB
 - 64KB cache
 - 84MB hard drive
 - 1024x768 graphics controller
 - MS-DOS 5.0, Windows 3.1
 - COMPAQ mouse
- Monitor priced separately
Call for pricing on other models
Lease for \$50/mo.

\$939



AST
Bravo

- 4MB RAM
 - 120MB hard drive
 - MS-DOS, Windows 3.1, Mouse
- | Processor | System Only | AST SVGA Monitor |
|-----------|-------------|------------------|
| 386SX33 | \$979 | \$1369 |
| 486SX25 | \$1049 | \$1459 |
| 486DX33 | \$1439 | \$1819 |
| 486DX2/66 | \$2179 | \$2539 |
- Lease for \$50/mo.

\$979



LEADING EDGE
486 Systems

- 1.44MB and 1.2MB floppy drives
 - Local bus slot, 1MB video RAM
- | Processor | Drive | Desktop | Minitower |
|-----------|-------|---------|-----------|
| SX25 | 107MB | \$1069 | \$1139 |
| SX25 | 130MB | \$1169 | \$1249 |
| DX33 | 130MB | \$1519 | \$1599 |
| DX33 | 213MB | \$1649 | \$1729 |
| DX2/50 | 213MB | \$1799 | \$1879 |
| DX2/66 | 213MB | \$2099 | \$2149 |
- Color VGA monitors start at \$229.99
Lease for \$50/mo.

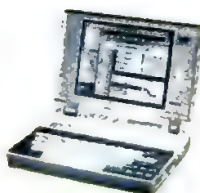
\$1069



LEADING EDGE
25MHz 386SL

- 25MHz 386SL
 - 2MB RAM, 80MB hard drive
 - 25MHz 386SX
 - 4MB RAM, 80MB hard drive
- | Hard Drive | 2MB RAM | 4MB RAM |
|------------|---------|---------|
| 60 MB | \$2149 | \$2249 |
| 80MB | \$2219 | \$2299 |
| 120MB | \$2479 | \$2549 |
- Lease for \$52.44/mo.

\$1429



TOSHIBA

- T1800SX 386SX20
 - 2MB RAM, 60MB hard drive
 - T3300SL 386SL25
 - 2MB RAM, 120MB hard drive
 - T4400C 486SX25
 - 4MB RAM, 120MB hard drive
- Lease for \$58.68/mo.

\$1599



TEXAS INSTRUMENTS
TravelMate WINSX25

- 25 MHz 486SLC
 - 2MB RAM, 60MB hard drive
 - 4MB RAM, 120MB hard drive
 - 4MB RAM, 120MB hard drive
- Lease for \$118.87/mo.

\$1749



COMPAQ

- Contura 3/25
 - Trackball
 - MS-DOS, Windows 3.1
- | Display | Hard drive | Price |
|---------|------------|--------|
| Mono | 120MB | \$2149 |
| Color | 84MB | \$2449 |
| Color | 120MB | \$2739 |
- | Display | Hard drive | Price |
|---------|------------|--------|
| Color | 84MB | \$3399 |
| Color | 120MB | \$3699 |
- Lease for \$78.87/mo.

\$2149



AST
Power Exec

- 4MB RAM
 - Windows 3.1
 - Trackball, 2 PCMCIA slots
- | Processor | Hard drive | Price |
|-----------------------|------------|--------|
| 386SL25 Mono | 120MB | \$2499 |
| 386SL25 Passive Color | 160MB | \$3199 |
| 386SL25 Active Color | 200MB | CALL |
| 486SL25 Mono | 200MB | \$2949 |
| 486SL25 Passive Color | 200MB | CALL |
| 486SL25 Active Color | 200MB | CALL |
- Lease for \$91.71/mo.

\$2499

TOLL-FREE SALES

1-800-669-4727

CUSTOMER SATISFACTION/TECHNICAL SUPPORT

1-800-697-4727

Sales Hours: Monday-Friday 9a.m.-9p.m. EST; Saturday 10 a.m.-6 p.m.; Sunday, Noon-6 p.m.

Customer Satisfaction: Monday-Friday 9a.m.-9p.m. From outside the U.S., call 508-624-6400.

24-hour toll-free FAX order line: 1-800-669-8329

PCs COMPLEAT

Real Service ♦ Unreal Prices

PCs COMPLEAT. All prices are subject to change, and do not include shipping. When you call PCs COMPLEAT, you'll always get the best available price. Lease prices reflect 36 month operating lease to approved business customers. Monitors are sold separately. COMPAQ is a registered trademark of Compaq Computer Corporation. AST and AST logo are registered trademarks of AST Research, Inc. Leading Edge is a trademark of Daewoo Telecom Corporation. WINSX is a trademark of Texas Instruments, Inc. Toshiba is a trademark of Toshiba America Information Systems, Inc. MS-DOS and Windows are trademarks of Microsoft Corporation. All other products or brand names are trademarks of their respective companies.

CIRCLE 268 ON READER SERVICE CARD

PCM-1/93B

Call for Your FREE Catalog

Call 1-800-258-8088 OPERATING SYSTEM KEY: W=Windows, D=DOS, B=Both

The PC Zone
Price, Availability and Service

\$68



LIST Enhanced

Increase the efficiency of your PC. By using the point-and-shoot interface in LIST Enhanced, you can select files for viewing, copying, moving, printing, archiving and execution—fast. Features include a directory tree display, split screen viewing to view two files at once, network and mouse compatibility and a telephone dialer. All using under 40K of disk space. It's ideal for laptops, PCs and networks. **Buerg D #10823**

After Dark for Windows 2.0

\$28



Now you can prevent screen burn-in with over 100 incredible displays. Enjoy digital sound, fun graphics, WallZapper, Network Password Support and password protection. **Berkeley Systems W #07787**



Star Trek: The Screen Saver

\$38

Beam aboard the Enterprise with Captain Kirk and Mr. Spock on a mission to prevent screen burn-in. You get over 15 animated displays from the original TV series, full compatibility with After Dark and password protection. **Berkeley Systems D #11555**

Aldus IntelliDraw

\$194

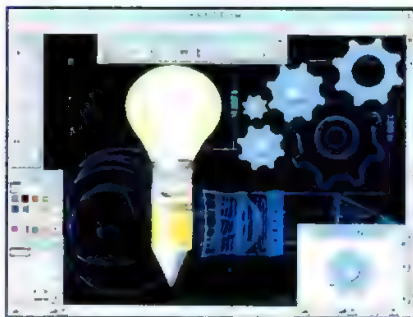
New from Aldus, IntelliDraw is an exciting new type of drawing program that gives you an easy way to visually experiment, refine and draw your ideas. Innovative smart tools link graphics in your drawing so they respond to changes automatically, making IntelliDraw one of the fastest ways to create dynamic drawings. You'll create visual what-if scenarios with features like intelligent clip art and templates, automatic symmetrical objects and dimension lines.

You also get auto-alignment, shape blending, arrows and dashes, powerful text handling capabilities, unlimited layers, color gradients, easy object animation, slide show mode, standard draw tools and more. Create simple animations and slide shows you can update "on the fly"—even during presentations. Perform complex drawing operations with a click of a button. You can even share files seamlessly between the Mac and Windows versions.

IntelliDraw starts with a complete set of standard drawing tools you already know, then goes further. Spontaneous experimentation, formerly hours of tedious work, takes just minutes with IntelliDraw.

Aldus IntelliDraw is the intelligent drawing program that provides a whole new way to visually express your ideas.

Aldus W #11190 - 3.5" disk only
W #07770 Gallery Effects **\$134**



IntelliDraw

These Tools Let You Draw Smart

- ▲ Complete set of standard drawing tools makes learning easy.
- ▲ Smart graphic objects easily link elements in your document for super easy updates and changes.
- ▲ Full text capabilities.
- ▲ Assistance with aligning, sizing and orienting objects helps you create accurate drawings quickly.
- ▲ Create clones of any graphic that change automatically when you change the master.
- ▲ Unique tools let you produce symmetric shapes and connect new shapes to existing objects.
- ▲ Intelligent templates and clip art have predefined relationships built-in to save you time.

\$1244

SuperMatch 17" True-Color Monitor

This is a best buy for your Windows applications. For this amazingly low price, you get a large-screen, true-color display perfect for Windows users. The 17" display automatically synchronizes to resolutions from 640 x 480 to 1024 x 786. It provides 6500 degree K white point for accurate color rendition, SmartTouch digital controls, SuperSquare antidistortion technology and 75 Hz flicker-free refresh rate. The SuperMatch 17" is the perfect monitor for demanding design and business applications. For this price, you can't beat the looks of this display. **SuperMac B #05123**

B #06234 SuperMatch 20" Multimode Trinitron **\$2698**
B #11826 Thunder/24 ISA **\$1598**
B #11828 Thunder/24 with QuarkXPress Bundle **\$2598**



NEW PRODUCT

CIRCLE 199 ON READER SERVICE CARD

TO ORDER CALL 1-800-258-8088

NOW SHIPPING
MON-FRI 9 AM-5 PM EST

NOTEBOOK COMPUTERS

AST PowerExec 386SL25 60MB	2109
AST PowerExec 386SL25 80MB Color 3385	
Compaq Contura 3/20 40MB	1379
Compaq Contura 3/25 60MB	1679
Compaq Contura 3/25 84MB Color	2598
Compaq LITE 386SL/20 40MB	2229
Compaq LITE 386SL/25 60MB	2599
Texas Instr 386-20WnSX 60MB	1729
Texas Instr 486-16WnSX 80MB	2149
Texas Instr 486-25WnDX 120MB	2835
Texas Instr 486WnDX/50 200MB	3399
Tohiba T1800SX/20 60MB	1529
Tohiba T1850SX/25 80MB	1879
Tohiba T4400SX 120MB	2449

COMPUTERS

AST Power Premium 386SX/25	1329
AST Power Premium 386DX/25	1649
Compaq Prolinea 386/25Z3 mod 1	679
Compaq Prolinea 486/33 mod 1	1399
Compaq Deskpro 486/33 M240W+	2379
Compaq SystemPro	ALL MODELS
DTK 286/386/486	custom quotes CALL
DTK 486/50 tower 4mb SVGA no-HD	1499
Wyse Terminals 30/50/60	294/375/298

DISK DRIVES

Conner CP3204 210MB 16mb IDE	469
Conner CP3544 540MB 12mb IDE	949
Imagema PC Powered 90 w/adaptor	529
Maxtor 7213A 213MB IDE	399
Maxtor LX7340A 340MB IDE	699
Micropolis	ALL MODELS CALL
Pacific Rim External floppy drive	CALL
Plus Hardcard II XL 50MB	227
Plus Hardcard II XL 105MB	329
Plus Hardcard EZ 240MB	569
Seagate ST3144A 130mb 16mb IDE	299
Teac dual floppy drive	149
Teac 3 5" or 5 25" floppies	79
Tohiba 3 5" or 5 25" floppies	69

MATH CO-PROCESSORS

Cyrix 80387SX-16/20/25	69
Cyrix 80387DX-16/20/25/33	89
ITT 80387SX-16/20	59
ITT 80387DX-16/20/25/33	79
Intel 80387SL	79
Intel 80387DX-16/20/25	79
Intel 80387DX-20/25/33	89
Welltek	ALL MODELS CALL

MEMORY PRODUCTS

AST Prem Exec 4MB	179
Okidata Laser 400 2MB	129
Panasonic KXP-4410/4430 1MB	119
Texas Instr MicroLaser 1MB	79
256x9 80ns DRAM	4.40
256x9 80ns SIMM	CALL
1MBx9 80ns SIMM	CALL
4MBx9 70ns SIMM	CALL

MICE

Logitech Dexa 3-button serial/PS/2	39
Logitech Dexa w/Windows 3.1	89
Logitech Kidz mouse w/software	49
Logitech Mouseman	79
Logitech Trackman Portable	95
Microsoft bus or serial 400 dpi	89
Microsoft Ball Point mouse	125

MIDWEST COMPUTER WORKS

QUALITY SERVICE & GUARANTEED LOWEST PRICING!

PRINTERS

PANASONIC

KXP1180/2180	149/179
KXP1123/2123	199/239
KXP1124/2124	275/309
KXP1824	339
KXP1654	536
KXP2824	365
KXP4410 Laser	619
KXP4430 Laser	869
KXP4450 Laser	CALL
KXP4455 Laser	CALL

NEC

P3200/P3300	239/339
P6200/P6300	419/629
P9300	869
LC95 Postscript	1379
LC97 Postscript	1799
ColorMate Postscript	4499

BICOMEX by Kodak

180ci	295
701 Inkjet	425
Color4 Inkjet	599

OKIDATA

164 Turbo	215
320/321	305/429
590+/591+	435/595
Laser 400	569
Laser 810	999
Laser 830/840	1279/1555

HEWLETT PACKARD

HP Portable	409
Deskjet 500	389
Deskjet 500C	516
Deskjet 550C	CALL
Laserjet IIP+	799
Laserjet IIP	979
Laserjet IV	1399
Laserjet IIId	2327
Laserjet IIISi	3285
Paintjet / Paintjet XL	CALL
Paintjet XL 300	2299
Scanjet 2P	849
Scanjet 2C	1444
Plotters	ALL MODELS

IBM

IBM Execjet	679
Laser 6/6P	1279/1475
Laser 10/10P	1399/1899
Laser 6A/10A	1649/2119

CANON

BJ-10EX Bubblejet	319
BJ-20 w/Needle	419
BJ-200	359
BJ-300/330	449/599
BJC-800 color	NEW

STAR

NX1020R Color	185
NX2420R Color	305
XB2420 Color	469

CITIZEN

GSX-140+/145	299/369
PN48/PN48Pro	299/349

COMPAQ

Pagermarq 15	3259
Pagermarq 20	4479

QMS

410 Postscript	1499
815/815MR	2969/3569
825/825MR	3359/4625
860 Hammerhead	3989
Colorsript 210	4519
Colorsript 230	7495

TEXAS INSTRUMENTS

MicroLaser Basic	859
MicroLaser Basic XL	1729
MicroLaser PS17+	1179
MicroLaser PS35+	1277
MicroLaser XL PS17	1999
MicroLaser XL PS35+	2269

SEIKO

Smart Label Printer+	139
CH-4104 Color Laser	3399

QUME

Crystal Express	CALL
-----------------	------

SIKOSH

SP-2400	165
LT-20/SL-90+	299/319

PLOTTERS & DIGITIZERS

Calcomp 12x12/12x18	297/597
Hewlett Packard Plotters	ALL MODELS
Kurta 12x12 PLP 12x17 Stone	249.5/377
Pacific Data ProTracer	1099
Summagraphics 12x12/12x18	312/549

BATTERY BACKUPS

American Power BK400 desktop	159
American Power AP4000 slimline	299
American Power AP600 slimline	389
American Power AP900 slimline	555
American Power Surge Arrest Plus	39
Tripp Lite BC500	179
Tripp Lite BC750	389
Tripp Lite Iso Bar 4	44

MODEMS

Boca Modem 14.4 v.32bis internal	229
Cardinal 2400 baud int MNP-5 software	59
Hayes Optima 14.4 + Fax 14.4 int	449
Intel SatFaxnet 100/400	99/998
Megahertz modems for all laptops	CALL
Practical Periph 14.4 send/rec fax int	359
US Robotics Sportster 14.4 fax mod int	339
US Robotics Courier HST 16.8 ext	549
Worldport Fax/Modems for external	CALL
Zoom V 42 bis w/mpp external	119
Zoom VFXV32 36/36 send/rec fax int	269

SCANNERS

Hewlett Packard Scanjet 2P	849
Hewlett Packard 2C	1449
Logitech Scanman 256	269
Logitech Scanman Color	579
Microtek Scanmaker II color	879
Microtek Scanmaker II XE	1199

SOFTWARE

Adobe Type Manager 2.0	59
Adobe Illustrator 4.0	419
Alkus PageMaker 4.0	489
Barclay Quattro Pro	299
Caere OmniPage Direct	249
Calera WorldScan Plus 1.1	399
Calera Faxgrabber	99
Central Point PC Tools 7.01	111
Corel Draw 3.0	389
Dahlgren Winfax Pro	75
DMA PC Anywhere IV	105
Lotus 1-2-3 ver 3.1 Plus	399
Microsoft Office 3.0	479
Microsoft Windows 3.1	89
Microsoft Word for Windows 2.0	299
Presentation Task Force V4.0	119
Symantec Norton Desktop	115
Stack Elec. Stacker	89
Word Perfect 5.1	269

100'S OF TITLES IN STOCK!

CD-ROM/MULTIMEDIA

Creative Labs Multimedia Starter kit	449
Creative Labs Multimedia Upgrade	559
NEC CD Express bundle	425
NEC CDR-84/74	539/599
NEC CDR-84 Multimedia Upgrade	1129
Pro Audio Spectrum Plus	149
Pro Audio Spectrum Plus 16	199
Pro Audio Multimedia Upgrade	729
Sony CD-31A internal drive	229
Sony CD-31ALN bundle	379
Sony CD-31ALL multimedia bundle	619
Sony CDU-7385 ext Multimedia bundle	NEW
Soundblaster Pro w/Midi	189
Thunder and Lightning	219
Toshiba MB3301 internal	419

TAPE BACKUP

Colorado DJ-10 40-120MB int.	195
Colorado DJ-20 120-250MB int.	249
Colorado Trakker 120MB parallel port	349
Colorado Trakker 250MB parallel port	419
Colorado QF-A-700 250-700MB int.	719
Irene A120PC 40-120MB int.	237
Irene A250PC 250MB int.	297
Maynard Mainstream 2 2gig w/SCSI	3399
Mountain 40MB int/ext	249/CALL
Muxman F10000 int	519

MONITORS

Goldstar 1480 14" 1024x768 28mm	279
Idex MF517 17" 1024x768	919
Idex MF5217 17" 1024x768 28mm	1049
MAG MX15F 15" 1280x1024 28mm	599
MAG MX17F 17" 1280x1024 28mm	1089
Mitsubishi DiamondPro 17" 1280x1024	1119
Mitsubishi HL8955 20" 1280x1024	1849
Nanaco 9000 16" 1280x1024 35mm	1099
Nanaco F550 17" 1280x1024 28mm	1123
Nanaco T560 17" 1280x1024 28mm	1299
NEC 3FXG 15" 1024x768 28mm	CALL
NEC 4FG 15" 1024x768 28mm	739
NEC 5FG 17" 1280x1024 28mm	1289
NEC 6FG 21" 1280x1024 28mm	2299
Panasonic C-1381 14" 1024x768	319
Panasonic C-1395 14" 1024x768 nL	425
Samsung ML 4571 14" mono VGA	129
Samsung Syncsc 17" 1280x1024 flat	999
Seiko 1440/1450 14" VGA 25mm	308/419
Seiko 1780 17" 1280x1024 25mm	1139
Seiko 2050 20" 1024x768 31mm	1789
Sony CPD13045 14" 1024x768 25mm	589
Sony CPD16045 17" 1024x768 25mm	995

VIDEO CARDS

ATI VGA Integra 1024x768 512k	79
ATI VGA XL24 24-bit 1MB	145
ATI Vantage 1MB w/mouse	145
ATI Graphics Ultra - 1MB w/mouse	295
ATI Graphics Ultra Pro EISA 2MB	529
Boca Basic VGA 640x480	59
Boca VGA 1024x768 512k/1MB	129/149
Diamond Speedster 24X 1MB 24-bit	159
Diamond Stealth Hi-Color 1MB	239
Hercules Gold series	CALL
Numa Nine GXI / GXe series	CALL
Orchid Pro Designer IIs 1MB	189

NETWORKING

3COM 3C503 Etherlink II	189
3COM 3C509 Etherlink III	139
Digiboard	ALL MODELS CALL
Intel Ether Express 16-bit coax	134
Lantronic Ethernet AE-2 Starter Kit	449
Lantronic Ethernet AE-2 starter kit	498
Netware 2.25-user / 10-user	479/1054
Netware 3.11-user	5674
Netware 3.11 10-user	1318
Netware 3.11 20-user	1828
Netware 3.11 50-user	2616
Netware 3.11 100-user	3647
Netware 3.11 250-user	5885
Netware 3.11 Premium 5 to 250 user	CALL
Netware Upgrades Available	CALL
Netware Life software	85
NEC 1000/NE2000 Board	99/135
SMC Arcnet PC130/270E	69/108
SMC Arcnet PC500WS/PC500FS	129/208
SMC Ethercard+ Elite/Elite16	119/139
Thara 0111/0198	68/123
Thomas Conrad 6245 Arcnet 16-bit	178
Xircom pocket lan adapters	CALL

FAX MACHINES

Hewlett Packard Fax series	NEW
Panasonic FX132 plan paper	1449
Canon	ALL MODELS CALL

WIDE SELECTION
Huge inventory. Thousands of items in stock and ready for immediate shipment!

ON-TIME
In-stock orders are shipped the same day. We are fast & efficient.

RELIABILITY
We earn your business! Over 70% of our orders are repeat customers.

KNOWLEDGEABLE
All of our salespeople are technically trained to provide you with the right solution!

SERVICE
If you don't find it ask, our friendly staff will special order products for you!

AST
PREMIUM EXEC 386SX 20MHz

- 386SX 20MHz 2mb RAM
- Expandable to 6mb RAM
- 1 44mb built-in floppy
- 40mb (80 or 80mb optional)
- VGA white LCD display
- 1-ser, 1-par, VGA, mouse or keyboard ports
- 6.5 lb., 9"D x 11"W x 2.2"H

\$1299

TEXAS INSTRUMENTS
TM3000 WinSX/20

- 386SX 20MHz 4mb RAM
- Expandable to 6mb RAM
- 80mb HD (80mb opt), 3.5" floppy
- VGA paper-white display
- 1-ser, 1-par, VGA, mouse & numeric keypad ports
- Windows 3.1 w/mouse
- 5.7 lb., 8.5"D x 11"W x 1.8"H

\$1729

NEW! TEXAS INSTRUMENTS
TM4000 WinSX/16

- 486SX 16MHz 4mb RAM
- Expandable to 8mb RAM
- 80mb hard drive, 3.5" floppy
- NEW brighter VGA display
- 1-ser, 1-par, VGA, mouse & keyboard ports
- Windows 3.1 w/mouse
- 5.6 lb., 8.5"D x 11"W x 1.8"H

\$2149

NEW! TEXAS INSTRUMENTS
TM4000 WinDX/25

- 486DX 25MHz 4mb RAM
- Expandable to 20mb RAM
- 120mb hard drive, 3.5" floppy
- NEW brighter VGA display
- 1-ser, 1-par, VGA, mouse & keyboard ports
- Windows 3.1 w/mouse
- 5.6 lb., 8.5"D x 11"W x 1.8"H

\$2835

COMPAQ
Contura

- 386SL 20 or 25MHz proc.
- 2mb RAM expandable to 10
- 1 44mb built-in floppy
- 40, 60, 84 or 120mb HD
- VGA 9.5" LCD display
- 1-ser, 1-par, VGA, keypad and keyboard ports
- 6.2 lb., 8.9"D x 11"W x 1.9"H

CALL FOR PRICES

OKIDATA
High Speed 24-Pin

Now with OKIsmart paper handling!

- With OKIsmart the printer automatically adjusts head gap to match the paper thickness
- 14-high quality scalable fonts
- Print speed up to 450 char/sec
- Emulates Epson LQ & IBM XL 24E
- 360 x 360 dpi graphics resolution
- Special Envelope paper handling
- 2-year Okidata warranty

ML590 \$435

Page Printing made Affordable
4-Page per Minute LED Page Printer

- 300 x 300 dpi resolution
- 512k memory (max 2.5mb)
- HP Laserjet II emulation
- 200 sheet paper capacity
- Manual feed capabilities
- 17 built-in bitmap fonts
- LED printhead technology offering higher reliability than lasers

OL400 \$569

High Speed Page Printing
8-Page per Minute LED Page Printer

- 300 x 300 dpi res. w/OKI Smoothing
- 1

GOOD NEWS FOR FLIGHT KNIGHTS:

Hunter carries the largest selection of portable computing equipment so that you can get the choices you want, when you want them! Ask us about next day delivery!



SHARP OZ 9600 PEN BASED PALMTOP
A Graphical User Interface Wizard using touch screen technology for quick data entry and retrieval. A major advancement in the use of pen-based technology in hand held tools. Organizer features are integrated using a unique "filer" system. **\$525**

Sharp		
PC-3000 Palmtop PC		\$875
OZ-8600 256K Wizard		449
OZ-8200 128K Wizard		297
OZ-7620 64K Wizard		239
OZ-890 PC Link -IBM PC		99

Canon		
SF-R20	W/256K	299
SF-R10	W/128K	269
SF-9500	W/64K	199
SF-8000	W/64K	119
SF-5300	W/64K	89

Palm		
SERIES3	W/256K	375
SERIES3	W/128K	259
Serial Ink- IBM PC		105
Parallel Link		45

Hunter's Policy

- Hours: 8:00 am - 7:00 pm CST, Mon to Fri
- Visa, Mastercard, personal and company checks accepted, no surcharge.
- Credit card not charged until order is shipped.
- \$5.00 on C.O.D. with \$1000 limit, cashiers check or money order only.
- Corporate POs, FPOs, and APOs welcome.
- Government and education pricing available.
- Texas residents add appropriate sales tax.
- No minimum order.
- Prices, promotions and availability subject to change without notice, call for current prices.
- 30 days return policy on non-defective products.
- Prompt replacement of defective goods.
- 15% restocking fee on non-defective goods.
- Shipping: UPS Ground, \$7 per order up to 7 lbs. \$1 per pound over 7 lbs.
- Next day and second day deliveries available.

Popular Software

ACCOUNTING		GRAPHICS		Norton Antivirus 2.1		\$80
ACCPAC Simply Acct.	\$116	Arts and Letters Appre	\$95	Norton Desktop 2.0		112
DacEasy Payroll 4.3	55	CA-Presents /Win	105	Norton Utilities 6.01		110
Managing Your Money	45	Corel Draw CD ROM	375	PC Tools 8.0		115
Peachtree Complete 6.0	173	Freelance Graphics	339	PC Tools 8.0 w/Stacker		175
Quicken 6.0	40	Harvard Graphics /DOS	390	Stacker 3.0		89
Quickbooks 1.0	81	Pagemaker 4.0 /Win	499	Star Trek Screen Saver		35
Time Slips 5	180	PrintShop Deluxe	45	SPREADSHEET		
COMMUNICATION/NETWORK		Ventura Publisher 3.0	496	CA-Compete 4.2		299
Act! DOS/Win	225	WP Presentation	285	Lotus 1-2-3 3.1		327
Carbon Copy Plus 6.1	125	PROJECT MANAGEMENT		MS Excel 4.0		295
DR DOS 6.0	65	CA-Up to Date	99	Quattro Pro		308
Elan Goldmine	149	MS Project /Win	430	WORD PROCESSING		
Procomm Plus 2.01	70	Time Line 5.0	435	CA-Textor		130
Laplink Pro	99	INTEGRATED PACKAGES		Wordperfect Win		255
MS Mail 3.0	425	CA-Simply Business	395	MS Word Win 2.0		295
Novell Products	call	PFS: First Choice 3.1	82	CD ROM TITLES		
PC Anywhere 4.5 Host	80	Lotus Works	95	Beauty and The Beast		59
ProComm Plus 2.1	70	Lotus Smart Suite 1.1	449	Talking Classic Tales		59
DATABASE		MS Works 3.0	95	MS Bookshelf/Win		75
CA-dBase IV /Win	317	PFS Window Works	68	Kings Quest V		39
dBase IV 1.5	509	OS UTILITIES		Willy Beamish		39
Fox Pro 2.0	475	After Dark Win 2.0	27	CALL FOR OTHER		
Paradox 4.0	520	Central Point AntiVirus	86	SOFTWARE and CD TITLES		
Clipper 5.01	459	MS Windows 3.1	89			
Q&A	235					



SIMPLY ACCOUNTING by Computer Associates is a fully integrated graphical accounting system designed for small businesses. Simply Accounting is designed to work in small, fast moving enterprises, so you feel right at home with all the time-saving, no nonsense features. An easy to learn, consistent menu structure, automatic transaction posting, pop-up customer, vendor, employee, job account and inventory lists for quick reference during transaction entry; and full integration of functions. **DOS or Windows \$116**

More portable peripherals for the business community than any other supplier!
If you don't see what you need... Call us today!



Golden Image 256 PRO Hand Scanner is the first hand scanner to provide 256 shades of gray at 800 dots per inch. Plus it comes bundled with GO-CR for optical recognition of documents, ProImage for Windows image editor and SCAN Utility for DOS.

Suggested retail price \$299

\$174



GVC 144 EXTERNAL FAX MODEM connects your notebook, laptop or desktop computer with practically anyone who owns a fax or modem. Whether at home or office you can send and receive faxes right from your computer, with only a few keystrokes.

\$279



CANT COUNT ON YOUR NOTEBOOK? The 17-key Micropad with Pass-Through parallel interface is the most popular and universally compatible numeric keypad for portable computers! Its "AT" style layout and 5' cable allow any user to fly through high speed data entry. Fully Programmable.

\$72

SCANNERS

Golden Image	
D.E. 256 PRO 800 DPI	\$174
D.E. 64 PRO 800 DPI	124
D.E. 64 400 DPI	88
Microtek	
Scanmaker 600G	825
Scanmaker 600Z	1325
Complete PC Full Page	545

NOTEBOOK PRINTERS

Canon	
PN48 PRO	347
PN48 STD	282
KODAK	
701	434
180SI	292
MICE	
Logitech Kidzmouse	52
Thumbelina Portable Mouse	68

TAPE BACKUP

Colorado	
250MB DJ20	\$259
120MB DJ10	199
250MB Trakker	435
120MB Traker	355
MULTIMEDIA	
Creative Labs	
External StartUp Kit	499
Internal Start Up Kit	435

MODEMS

Pocket Modems	
GVC FMM9696/24	\$125
GVC FMM9648/24	95
External Modems	
GVC EXT. FM9696/24V	119
MEMORY CHIPS!	
CALL US FOR BEST PRICING!	

HUNTER

12816 Fallstone Road, Suite 510, Houston, Texas 77060 ■ Customer Service: (713) 530-0628 ■ 24 Hour FAX: (713) 530-2621



(800) 800-9555



5 Great Reasons to purchase from First Source

It is a pleasure to know that there is someone in the computer merchandising and service arena that is genuinely concerned with customer satisfaction. Thank you very much!

C. D. Smith, Jr., CA

The delivery was prompt, the packaging was outstanding, and the price was exactly as quoted. The board does exactly what the salesperson said it would. What more could I ask for? Thank you.

S. P. Neese, NY

Having dealt with many other computer hardware and software companies, I am familiar with the broad range of service available in the computer industry. When it comes to mail order memory, your company is simply the best!

D. R. Gimbel, NY

Your service is fantastic, and your memory is too! I'm very pleased with the service your company has offered and the quality of the products. Thank you.

M. Martini, Italy

Whenever I can, I will recommend to buy at your company because there are not very many companies who have such excellent and competent support. Many thanks.

M. Jakob, Germany

For years, First Source International, Inc. has been specializing in memory upgrades, gathering information and experience in getting the highest performance out of a computer system. With over 1400 different computer and laser printer configurations detailed in our upgrade solution database, your sales representative can offer all the answers to your most complicated upgrade questions. Although we have lost count of all the "thank you's", we never tire of hearing the two words that make the hours of training, research, and product testing pay off!

Thank You!

If you are unsure of the proper upgrade path for your computer system or laser printer and would like a straight answer, take a moment to call First Source. Call toll free from anywhere in the U.S.A. or Canada, send a letter, or a fax. We are happy to respond immediately to all your questions.



Toll Free from anywhere in the US or Canada

800/262-9866

International

714/588-9866

Fax: 714/588-9872

714/588-9872

Personal Computer Memory

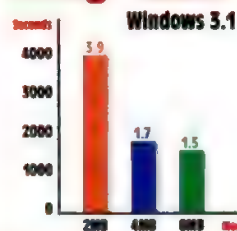
IBM

PS/1 286, 500K			
286 529P935	\$79	4MB 529P664	\$129
PS/2 25/286, 50/286, and memory adapter 1M1221			
286 Kit	\$69		
PS/2 333; 15, 405K, 500, 555K; 15, 655K; 15, 70, and 85C486			
1MB	\$49		
2MB	\$59		
PS/2 70-82; 405, 500, 555K; 15, 655K; 15, 70, and 85C486			
2MB	\$79		
PS/2 333; 15, 405K, 500K, 555K; 15, 655K; 15, 70, and 85C486			
4MB	\$99		
PS/2 333; 15, 405K			
4MB	\$129		
PS/2 90, 95, P75 (install in pairs), 56, 57 (all), PS/1 Pro 80/25			
2MB	\$99		
PS/2 90, 95, P75 (install in pairs), 56, 57 (all), PS/1 Pro 80/25			
4MB	\$129		
PS/2 90-111; 311; 321; 521; 561; 161			
2MB	\$99		
PS/2 90-121; 311; 321; 521; 561; 161			
4MB	\$129		
Expansion boards for 50, 56, 57, 55, 60, 85K			
2-8MB w/286	\$299		
2-16MB w/286	\$399		
Expansion boards for all models 70 and 80			
2-8MB w/286	\$59		
4-16MB w/286	\$69		
Expansion boards for all models 70, 80, 90, and 95			
4-64MB w/286	\$429		
8-64MB w/286	\$649		

DELL

32052; 320P/8; 320P/16; 433P; 606P/8			
1MB	\$19		
4MB	\$169		
606P and 6060			
16MB module	\$449		
420; 425; 433; 4500E/32 and TE			
2MB	\$119		
4MB	\$169		
420; 425; 433; 4500E and TE			
2MB Kit	\$129		
PowerMate 286/12; 50/16 and SL/20			
2MB Kit	\$99		
PowerMate 386SX/20; 20v; 16; 25; 486/50; 486/53			
2MB Kit	\$279		
PowerMate SX Plus			
2MB Board	\$279		
4MB Board	\$359		
PowerMate SL/20			
2MB CPU Upgrade	\$169		
2MB Exp. Board	\$299		
PowerMate 586/20; 25			
2MB	\$329		
APC-H635	\$359		
APC-H634	\$359		
PowerMate 586/333E and 486/25E			
2MB	\$199		
PowerMate 586/333; Express Te and e series			
1MB	\$79		
4MB	\$179		
16MB	\$649		

Why add more memory?



- An upgrade from 2MB to 6MB can increase performance up to 160%.
- Memory allows Windows to run faster.
- Reduces your system's need to access the hard disk.
- Speeds up programs which use virtual memory.
- Allows you to utilize numerous and extensive applications at the same time.

*This graph displays the amount of time it takes to run one specific Windows application with the indicated amount of memory.

Compaq

ProLima 5/25; 5/25K			
2MB 161750-001	\$99	4MB 161742-001	\$285
ProLima 6/33			
1MB 161682-001	\$99	2MB 161683-001	\$89
1MB 161684-001	\$159	4MB 161685-001	\$329
DeskPro 386-20, 20v and 25			
1MB 113151-001	\$49	4MB 113152-001	\$159
1MB Board	\$119		
4MB Board	\$219		
DeskPro 386/16			
1MB 113144-001	\$75	4MB 113145-001	\$159
1MB Board	\$119		
4MB Board	\$219		
DeskPro 386/16			
1MB 113144-001	\$75	4MB 113145-001	\$159
1MB Board	\$119		
4MB Board	\$219		
DeskPro 386/16			
1MB 113144-001	\$75	4MB 113145-001	\$159
1MB Board	\$119		
4MB Board	\$219		
DeskPro 386/16			
1MB 113144-001	\$75	4MB 113145-001	\$159
1MB Board	\$119		
4MB Board	\$219		

AST

Bravo 386-16, 16v, 20v, 25v			
2MB 500510-002	\$49	4MB 500510-008	\$179
Bravo 3/25			
2MB 500510-004	\$99	4MB 500510-002	\$199
Premium 386/25; 33; 33T, Premium II 386SX/16; 20			
1MB w/80P	\$69		
Bravo 4/33; 486/25; Premium II; TE Server SE 4/33			
2MB w/80P	\$119		
Premium II (all), Premium 386/33T and 386SX/16			
4MB w/80P	\$149		
All Premium 386/33T, 486/33T, Server SE 4/33, Bravo 486			
1MB w/80P	\$299		

DEC

DECstation S series S; C; Plus; and 425c			
512K Kit	\$29		
2MB Kit	\$199		
DECpc 4005T series			
1MB Kit	\$109		
2MB Kit	\$299		
4MB Kit	\$649		
DECpc 4205S; 433 and 430T			
2MB Kit	\$99		
4MB Kit	\$299		

Apple

Macintosh LC; LCX; Classic II			
4MB Kit	\$104		
8MB Kit	\$189		
Macintosh (Quadra 700; 900 and 950)			
16MB Kit	\$374		
32MB Kit	\$179		
64MB Kit	\$199		
Macintosh IIfx			
4MB Kit	\$129		
16MB Kit	\$389		

Zenith

Zenith Z-386/25; 33; 33 and 33E			
1MB 2A3000ME	\$49	4MB 2A3000ME	\$149
Zenith Z-386SX/20; 280P+; 2-LS			
2MB Kit	\$99		
Zenith 486/33; 25			
4MB 2A2200ME	\$189	16MB 2A2200ME	\$599

Hewlett-Packard

Vectra 65/165; 200P; 85/200P; 25PC; 20C			
4MB Kit	\$189		
Vectra 386/16; 16v; 20v			
2MB 02406A	\$99	4MB 02406A	\$319
Vectra 486 PC (install in pairs)			
4MB 02151A	\$169	8MB 02151A	\$549
Vectra 386/25; 486/25T; 33T (install in pairs)			
2MB 02501A	\$99		

Laptop and Notebook Memory

Apple

PowerBook 100	4MB	\$185
PowerBook 140 and 170	4MB	\$245
	6MB	\$179
	8MB	\$239

AST

Premium Exec Notebook	1MB	\$69
	4MB	\$129

Compaq

Contura 5/20 and 5/25	4MB	\$159
	8MB	\$239
LTE 286	2MB	\$119
	4MB	\$199
LTE 386/20	4MB	\$199
	8MB	\$239
LTE Ultra 20; 25; 25c	2MB	\$109
	4MB	\$129
SLT 286	1MB	\$89
	4MB	\$279
SLT 386/20	1MB	\$89
	4MB	\$199

IBM

PS/2 C1575X Color Notebook	4MB	\$349
	8MB	\$489
PS/1 Notebook (All)	2MB	\$179
	4MB	\$289
1405X and 1455X Laptop	4MB	\$155
1405X	8MB	\$285

NEC

Ultralite 286P	1MB	\$159
	4MB	\$389
Ultralite SL/20	2MB	\$179
	4MB	\$389
Ultralite III, SL/25C	2MB	\$189
	4MB	\$249
Ultralite SL/20, SL/25P	2MB	\$189
	4MB	\$299

Sharp

PC-6220 Notebook	1MB	\$89
PC-6501 Notebook	2MB	\$179

Dell

AL20 and AL25 Notebook	2MB	\$149
212N and 320N Laptop	1MB	\$89
212N and 320N; 16v; 25v; 486/50; 486/53	2MB	\$179
525N; 16v Notebook PC	2MB	\$149

Texas Instruments

TravelMate 2000	1MB	\$89
TravelMate 3000, WinSX	2MB	\$179
TravelMate 4000	4MB	\$219

Toshiba

T1000SE; 1E; 1E, 2000SX; 500, 2200SX	2MB	\$85
	4MB	\$169
	8MB	\$319
T1200SE, 1600, and 1700E	2MB	\$89
T1900SX, 3200SX, and SXC Portables	2MB	\$189
	4MB	\$149
T3200	2MB	\$149
T3300SL Notebook	2MB	\$134
	4MB	\$189
T4800 and T4900, SL, SXC Notebook	2MB	\$139
	4MB	\$189
	8MB	\$389
T5100	2MB	\$185
T5300; T5300C and T5900	2MB	\$182
	4MB	\$299

Zenith

Z-Note Notebook	2MB	\$169
	4MB	\$499
MasterPort 386SX, SL, SLc	2MB	\$189
MasterPort 386SX	2MB	\$199
SupersPort SX, 20v; 25v; 486/50; 486/53	2MB	\$159
SupersPort 286; 286v	1MB	\$99
SupersPort 286; 286v	2MB	\$279
TurboPort 386; 386v	1MB	\$89

JRIDA-PCMCIA "Credit Card"

5-8MB	1MB	\$219
-------	-----	-------

Everex

Tempo LE Notebook	2MB	\$89
Tempo Carrier Notebook	2MB	\$119

Sony or Teac

Notebook Memory	2MB	\$89
-----------------	-----	------

Panasonic

CF10, CF20, CF30	1MB	\$39
------------------	-----	------

Grid

1450SX	2MB	\$189
1500 Series	4MB	\$229

Magnavox or Packard Bell

286 and 386SX Notebook	1MB	\$89
	4MB	\$199

We'll meet or beat any advertised price!

CALL THE UPGRADE EXPERTS

Laser Printer Memory

Apple LaserWriter IIx and IIfx	4MB 1002551-A \$124	16MB N/A \$436
Hewlett-Packard LaserJet HP, III, HP, HPD	2MB 334758 \$90	4MB 334770 \$130
Hewlett-Packard LaserJet II and III	2MB 334448 \$92	4MB 334458 \$140
Hewlett-Packard LaserJet IIIi and IIIiX	4MB C2065A \$165	8MB C2066A \$249
Hewlett-Packard DeskJet 500, 500C, 500E	220779 \$99	
IBM Laser 4020 All Models	2MB 710554 \$99	4MB 710555 \$129
IBM Laser 4070 and 4070E	2MB 705037 \$119	3.5MB 705067 \$149
Canon LBP-4, LBP-8, LBP-8S	1MB 343-2230 \$110	2MB N/A \$140
Canon LBP-III, IIIi and IIIi Plus	2MB 343-2330 \$240	3MB 343-2340 \$299
Brother HL-4	1MB 000-910 \$129	2MB 000-920 \$140
Brother HL-4	2MB 000-920 \$179	4MB 000-940 \$219
Panasonic 4410 and 4430	2MB KI-P441 \$110	4MB N/A \$140
Panasonic 4430i and 4430	2MB KI-P441 \$110	4MB N/A \$140
Panasonic LaserPartner 4430	2MB KI-P442 \$119	
Toshiba Page Laser 6	2MB 150-000000 \$100	4MB 150-000000 \$140
OKI Laser 400	1MB 70045001 \$79	2MB 001 N/A \$99
OKI Laser 600 and 820	1MB 70045201 \$80	2MB N/A \$140
OKI Laser 610	1MB 70021001 \$110	2MB 70021101 \$140
OKI Laser 630 and 640	2MB 70045001 \$100	
Texas Instruments Microlaser 3L	1MB 2505759-0001 \$40	4MB 2505752-0002 \$200
Epson LPL 8000	2MB 052401 \$90	4MB N/A \$140
Epson ActionLaser II, LPL-8000	2MB N/A \$100	4MB N/A \$250
Epson LPL-7500	2MB C822051 \$190	4MB C822021 \$339

Video Cards

Diamond Computer Systems, Inc.	
Switch 24 24 Bit, 16.7 million colors	\$209
OpenSTAR 24X 24 Bit Magazine's Editors Choice. Provides 100% VGA 24-bit "true color" support for 16.7 million colors	\$160
Boca Research	
Basic VGA (2540) 640x480 16 color	\$45
VGA Plus (2540) 800x600 16 color	\$75
VGA Plus (5120) 800x600 256 or 1024x768 16 color	\$80
Super VGA (5120) 1024x768 16 color	\$110
Super VGA (1000) 1024x768 256 color	\$140
Super II VGA (1000) 1024x768 256 color or 640x480 32,768 color	\$150

Math CoProcessors

Introducing The Price Performance Leader In Math CoProcessors.

CHIPS
Chips and Technologies, Inc.

Chips and Technologies

SB7000X-16	\$59	SB7000X-20	\$75
SB7000X-25	\$72	SB7000X-35	\$70
SB7000X-60	\$88	SB7000X-16 (3X)	\$69
SB7000X-20 (3X)	\$71	SB7000X-25 (3X)	\$74

SIMM Modules

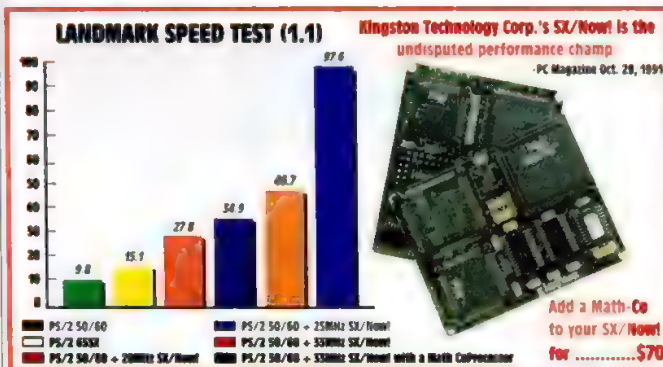
Industry Standard 50-pin SIMMs	
1MB x 8 70ns, Fast Page Mode	\$34
4MB x 8 70ns, Fast Page Mode	\$154
36-pin, 72-pin SIMMs for use in ISA systems and others.	
512K x 16 70ns or 80ns (2MB)	\$79
1MB x 16 70ns or 80ns (4MB)	\$159
2MB x 16 70ns or 80ns (8MB)	\$289
4MB x 16 70ns (16MB)	\$539
SIMM Modules for most Apple Macintosh models and Quadra	
2MB x 8 70ns, Fast Page Mode, Low Profile	\$53
4MB x 8 70ns, Fast Page Mode, Low Profile	\$95
8MB x 8 70ns, Fast Page Mode, Low Profile	\$155
16MB x 8 70ns, Fast Page Mode, Low Profile	\$409
SIMM Modules for Macintosh IIfx machines	
4MB x 8 70ns, Fast Page Mode, Low Profile	\$97
16MB x 8 70ns, Fast Page Mode, Low Profile	\$419

Kingston

TECHNOLOGY CORPORATION

Turn your 286 into a 386SX with the Kingston SX/Now!

The SX/Now! provides true multitasking and background operations for Windows, OS/2, and 386 specific software. SX/Now! allows the new 20MHz, 25MHz, or 33MHz processor to run at full potential speed and improves system performance by up to 350%. All SX/Now! upgrades include 16Kb of cache and a math coprocessor socket.



The Kingston Technology SX/Now! is now available for:

- ✓ AGI 1800 A; B; C
- ✓ AST Premium 286; Bravo 286
- ✓ IBM Original AT & XT/286
- ✓ HP ES286/12 & ES/8
- ✓ Epson Equity IIe & II+
- ✓ Compaq Portable III, DeskPro 286
- ✓ NEC PowerMate 286+, Portable+
- ✓ IBM PS/2 25/286, 30/286, 50, 502, 60

20MHz SX/Now!	\$259
25MHz SX/Now!	\$299
33MHz SX/Now!	\$329

Expansion Boards

BOCA RESEARCH INC.

PC, XT, AT, PS/2 Memory Boards

Bocastar XT 512K-2MB for XT and PS/2 25/286 and 50/286 machines. Provides 128K 4.0 expanded memory only.

M/312K	\$162	M/15MB	\$181
M/1MB	\$162	M/27MB	\$199
Bocastar AT Plus 2-8MB memory board for 486/286 & 486/386 compatible machines running up to 33MHz. Get conventional, expanded (LIM EMS 4.0) and/or extended memory, OS/2.			
M/2MB	\$199	M/4MB	\$229
M/6MB	\$229	M/8MB	\$249

Memory I/O Boards

Bocastar AT I/O Plus 2-4MB memory board, same as AT Plus with 1 serial and 1 parallel port. Uses 1M x 1 DRAM chips.

M/2MB	\$199	M/4MB	\$279
-------	-------	-------	-------

Motherboards

80386 CACHE Motherboards

- Baby AT Form Factor (8.5" x 13")
- AMI Bios
- Landmark 1.16: 54.1MHz
- Includes 128K of on-board cache
- Up to 32MB on-board with 1MB or 4MB SIMMs (Price 00)

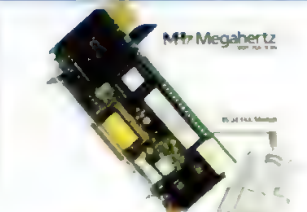
80386-33MHz	\$319
80386-40MHz	\$229

486 CACHE Motherboards

- Baby AT Form Factor (8.5" x 13")
- Intel 80486 CPU with AMI Bios
- Landmark 1.16: 101.3MHz, Version 31.52.0
- Includes 256K of on-board cache
- Up to 32MB on-board with 1MB or 4MB SIMMs (Price 00)

80486-33MHz	\$729
80486-50MHz	\$1119

Modems & Fax/Modems



Boca Research

Internal and External Modems for your favorite PC

14.4Kbps FAX/Modem

V.32 Modem with V.42/V.42bis Throughput up to 57,600bps!

Internal	\$269
External	\$349

MHz Megahertz CORPORATION

Internal FAX/Modems for AST, Compaq, IBM, Sharp, TI, Toshiba, and Zenith laptops.

9600 FAX/9600 Modem

V.32 Modem with V.42/V.42bis Throughput up to 58,400 bps! as low as

Internal FAX/Modems with Send & Receive with V.42/V.42bis MNP-5

24/9600bps as low as	\$219
96/9600bps as low as	\$469

Pocket FAX/Modem

For all Laptop and Notebook Systems with an RS-232 serial port. With V.42/V.42bis MNP-5.

24/9600bps as low as	\$249
96/9600bps as low as	\$469

30 Day

Money Back Guarantee
Buy with confidence!

First Source International

"The Only Source for Computer Upgrades"

- 30 Day Money Back Guarantee
- 100% compatible in form, fit, and function
- User installable products
- Installation instructions included
- Toll-free technical support
- Thousands of items in stock
- Manufacturer's warranties
- Corporate PO's, APO/FPO's
- Government & Educational pricing
- International orders welcome
- Special volume pricing
- 24-hour fax line



Same day shipping

Overnight delivery available



- Visa, MC, AMEX, and Discover
- No surcharge on credit cards
- Call for any items not listed

Toll Free from anywhere in the United States or Canada

800/262-9866

International

714/588-9866

Facsimile

714/588-9872

Business Hours

Monday-Friday 8AM-5PM
Saturday, 10AM-3PM P.S.T.



Mail orders to:
First Source International, Inc.
36 Argonaut, Suite 140
Aliso Viejo, CA 92656 USA
714/588-9866

We'll meet or beat any advertised price!

TOLL FREE 800/262-9866

TELECOMART

OVER A DECADE OF EXPERIENCE

WINDOWS

386 Max Windows v6.0	\$60	MS Productivity Pack	\$36
Adobe Illustrator 4.0 for Windows	365	MS Project for Windows	412
Adobe Streamline Windows	120	MS Project for Windows Upgrade	135
Adobe Type Manager Windows	59	MS Publisher for Windows	120
After Dark 2.0	28	MS Windows 3.1 Upgrade	49
Ami Pro 3.0	233	MS Word for Windows	299
AutoSketch for Windows	169	MS Word for Windows Upgrade	116
BitFax for Windows v2.0	47	MS Works for Windows	120
Corel Draw 3.0	387	Norton Antivirus	82
Corbind Copy v3.1	328	Norton Backup	95
Carbon Copy for Windows	129	Norton Desktop for Windows	117
Crosstalk for Windows	115	Objection for Windows	101
dBFast for Windows	325	Omni Page 386 v3.2	432
Facelift for Windows	59	On Time for Windows	70
Harvard Graphics for Windows	358	PC-Kwik Power Pak/Disk	76
ICON-Do-It	19	PerFORM Pro	178
Lotus 1-2-3 for Windows	301	ProComm Plus for Windows	82
MathType Windows	159	Quicken v2.0 for Windows	27
MS Access	89	RightWriter for Windows	53
MS Entertainment I,II,III,IV	25	SuperBase 4 Windows	465
MS Excel for Windows	293	Turbo C++ Windows	102
MS Excel for Windows Comp Upg	119	Wide Angle	73
MS Money for Windows	15	WinConnect	59
MS Office for Windows	454	WINFAX Pro	71
MS PowerPoint for Windows	293	Winspeed	55
MS PowerPoint for Windows Upg	116	Wintools	69
		WordPerfect for Windows	263
		WordPerfect for Windows Tradeup	76
		Wordscan v 206/386 2Mb OCR	411

OFFICE ON THE GO

LAPTOP

Appointment	
Thumbelina Portable	\$90
Battery Watch Pro v4.0	29
Brooklyn Bridge w/Par & Ser Cable	85
DeskLink	101
Laplink Pro v4.0	89
Logitech Mousman Serial Cordless	82
Microsoft BallPoint Mouse	110
MicroSpeed MicroTrac	54
Software Bridge 5.1	70
VGA Dimmer	23
Winconnect	59
Toshiba	
All Models	Call

NOTEBOOK

Leading Edge	
386SL 25/80	\$2519
386SL 25/80	\$2629
D4 486SX/20	\$1256
NoteStar 386SX 20 80 Mb	1370
Panasonic	
All Models	Call
Texas Instruments	
3000 WINSX 60Mb	1649
4000/16 WINSX 60Mb	2005
Other Models	Call
PALMTOP	
Poquet Hand Held	\$570

CD ROM/MULTIMEDIA

HARDWARE

Sony	
CDU 7211	\$545
CDU 7205	456
CDU 541	421
31A Photo CD Ready	Call
Chanon COS 431 w/Crystal Bdlie INT	397
CDX 431 w/Crystal xt	513
CDX 431 w/SW EXT (Crystal Bundle Software)	477

SOUND CARDS

Creative Labs	
Sound Blaster 2.0	\$91
Sound Blaster Pro	185
SoundBlaster Video Blaster	332
M/M Upg. w/SB Pro Ext + SW	589
M/M Upg. w/SB Pro Int + SW	523
MediaVision Pro 16 M/M Syst. (NEC 84 Multispin Dr+SW)	899
MediaVision M/M PC Upg	
535 w/SW	705

100'S OF CD SOFTWARE TITLES STARTING AT \$11

Smart and Friendly

CD ROM Bundle

Panasonic 522 w/controller & Audio Play Software	\$347
Internal	394
External	394
Caddy-less CD-ROM	
900 External	376
900 Internal	322
800e External	317

COMPLETE MULTIMEDIA SOURCE (For your laptop)

SCSI to Parallel converter	\$148
MTS/Multimedia 80 Watt Speakers	64
MediaVision Pro Audio 16	192

NETWORKING & LAN

SOFTWARE

ACCPAC BPI LAN	\$230
FoxBase Plus Runtime Lan	306
FoxPro Dist Kit	306
FoxPro Lan 2.0 - 6 Pak	547
Lanspool 386	385
Novell Network 286 2.2 5Pk	498
Novell Network 386 Prem 5Pk	669
Novell Network 386 v3.11 10Pk	1304
Novell Network 386 v3.11 20Pk	1824
Novell Network Lite w/Dr DOS	50
Packrat Network Pack 3-user	410
Revelation Adv LanDisk	588
Smartware II Net Node (5 Pk)	614

HARDWARE

Eagle	
NE 2000 EtherNet Adapter	\$135
NE 3200 EtherNet Adapter	672
Netw are Lite Add on	394
Artisoft	
LanTastic AI NDS Single Node	55
LanTastic 2MBPS Starter	332
LanTastic AE-2 Ethernet Adapter	202
LanTastic AE-2 Ethernet Starter	469
Others	Call
Standard Microsystems	
Ethercard Elite	128
Ethercard Elite TP	128
12 Port Concentrator	712
8 Port Concentrator	329
Tiara All Other Models	Call
Turbo Cadd	75
CalComp	
33120-34 Dig12x12 16B	298
33120-34 Dig12x12 4B	298

CAD & ENGINEERING

Design CAD 2-D	\$165
Draft Ultra v4.0	234
Generic CAD 6.0	281
Houston DMP-161	2689
Houston DMP-162	3499



NOVELL NETWARE v3.11

- 5 Pak \$549
- 10 Pak \$1299
- 20 Pak \$1779
- 50 Pak \$2449
- 250 Pak \$6199
- 3.5" and 5.25" Formats

OCR/SCANNERS HARDWARE

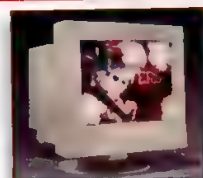
Complete All Models	Call
Logitech	
Logi Scanner 256	288
Logi Scanner 32 CatchWord Bdlie	175
Logi Fotomem	548
Microtek	
Scanmaker IIX	1126
Scanmaker II W/Dos	865
SOFTWARE	
Wordscan Plus 206/386 2Mb	411
CAT Reader Pro 1/2 Page	156
OmniPage Professional 2.1	629

TERMINALS

Wyse	
30+	\$279
50+	368
60+	291
190+	272
160+	337
185+	321
All Others	Call

FONT CARTRIDGES

Pacific Data 4 Memory 2 MB	\$159
All Others	Call



NEC MULTISYNC® 6FG

The MultiSync 6FG Monitor provides an extremely large screen area for professionals needing state-of-the-art display of powerful CAD or color desktop publishing applications

\$2,325

DISKETTES

Sony	
5.25 D/S D/D (100)	\$95
5.25 D/S D/D Disks (100)	45
5.25 High Density (100)	71

CO-PROCESSORS

Cyrix	
80387-SX 20	\$67
80387-DX 25	85
80387-DX 33	85
80387-DX 40	88
80387-SX-16	67
Intel	
80287-XL	82
80387-DX 33	83
80387-SX-16/20	77
Others	Call

KEYBOARDS

Keytronics KB101Plus \$36

TAPE BACKUP

Colorado Memory System	
TC15 Adptr for DJ20	\$178
Jumbo 250 INT	252
Tracker 120Mb	195
Tracker 250Mb	355
DC-2120 Tapes	429
Everex 1-Gig/566 TapeBackup	20
Iwmm	1079
Accutrak A120 Tape Backup	176
Accutrak A250 Tape Backup	230

POINTING DEVICES

MS Bus or Serial w/Windows 3.1	\$142
MS Serial Mouse (Bare Bones)	\$1



DATAPERFECT

Menu-driven relational database for powerful but simple applications. Users may create as many as 80 files per database, 16 million records per file, and 80 fields per record. Network versions available.

\$275

BOARDS

ATI	
Graphics Ultra 1Mb	\$308
VGA Wonder XL24 1Mb	142
Other Models	Call
Diamond	
SpeedStar 24X	186
Diamond Stealth 24 2Mb	185
Diamond Stealth 24/24VLB 2Mb	Call
Stealth 1Mb w/Hi-Color	222
SuperStar Vlb 2Mb	Call
Viper Vram 24 Vlb 2Mb	Call
Everex	
RAM 3000 Deluxe	77
RAM 8000 Excel	163
Hercules All Models	Call
Intel All Models	Call
Orchid All Models	Call

HARD CARDS

Plus Development	
II XL50 MB	\$221
II XL105 MB	317
Other Models	Call



WORDPERFECT FOR WINDOWS

WordPerfect® for Windows™ is a powerful CUA compliant word processor containing all of the capabilities of WordPerfect 5.1 for DOS, as well as new features that take full advantage of the Windows graphical user interface

\$263



CA-SIMPLY BUSINESS

The friendliest collection of Windows™ software in the world. And it's integrated so all the modules work together. Easy to learn and easy to use, CA-Simply Business lets you do everything with just a click of the mouse.

Call

MONITORS

Aamazing All Models	Call
Amdek All Models	Call
Arche 14" SVGA 28 1024 X 768 HZ	343
Hatchi	
Superscan 15"	550
Superscan 17"	1034
Superscan 20"	1358
MAG	
15F	670
17F	1134
Mitsubishi	
KC 1410 CEGA	239
Other Models	Call
Nano F550 17"	1124
Nano F560 17"	1899
NEC	
Multisync 3FG 15"	653
Multisync 4FG 15"	776
Multisync 5D 20"	1493
Multisync 5FG 17"	1389
Multisync 6FG 21"	2371
Sony Multisync 1304S 14"	612
ViewSonic 6E	369
Zenith 1485	625



WINFAX PRO 3.0 FROM DELRINA

New WinFax Pro 3.0 sends, receives and manages faxes from within Windows. Categorize faxes using detailed descriptions, keywords, and archiving. Mark faxes using powerful annotation tools.

\$71

COMPUTERS

NEC	
Ready 325 System	999
Ready 425 System	1397
Ready 435 System	1731

IBM Value Point

386 SL C 25	173
486 SX 25	966
486 DX 33	1352

MTS

- Always in Stock!!!
- 30-Day money-back guarantee!
- Twice PC Magazine's Editors Choice!
- 2 Year Warranty!!!

- Nationwide On Site Service
- Microsoft EasyDOS 5.0
- 4Mb RAM
- 1.2 & 1.44 Drives
- Focus 2001 Keyboard
- SVGA Card
- SVGA Non Intell Monitor
- The Getting Started Manual with Windows Supplement
- 386-40/64C 130Mb HD 1299
- 486-33/64C 213Mb HD 1749
- 486DX-50/256C 213 Mb HD 1999

PCM12693

PRINTERS

LASER	
Hewlett Packard	
Desk Jet 500C	9621
Desk Jet 550C	732
Laser Jet IIP	821
LaserJet IHP	1026
Laser Jet IV	1449
IBM	
Lexmark Laser SE	1125
Lexmark Exejet	645
NEC SilentWriter II Model 95	1399
Okidata	
OL-400 Par	599
OL-810	1019
OL-820	1169
OL-830	1229
OL-840	1575
QMS PS2210	4150
Texas Instruments MicroLaser	872

DOT MATRIX	
Citizen All Models	Call
Compaq	
Pagemark 15	3332
Pagemark 20	4586
Epson	
AP3250	200
LB570	279
Other Models	Call
OTC Lxprime 600	4780
Okidata	
320	315
321 ML Par	435
590	439
591	599
3410	1199
Other Models	Call
Panasonic	
1123	214
1124	309
1686	379
1180	153
2624	365
Other Models	Call
Star Micronics All Models	Call

OTHER	
Canon BJ-10EX	\$309
Canon BJ-20	408
CoStar Envelope Printer	444
CoStar Labelwriter II	178
CoStar Labelwriter II +	265
Diconia 701 Printer	425
Seiko Smart Label + Printer	135

COMMUNICATION HARDWARE

ATI All Models	Call
Cardinal All Models	Call
Complete All Models	Call
Everex All Models	Call
Hayes	
Optima 9600 EXT w/SC/EZ	330
Other Models	Call
Intel All Models	Call
Practical Peripheral	
24/36 Int SD/RC	92
PM 14400 EXT	394
All Models	Call
Prometheus All Models	Call
U.S. Robotics	
Sportster 9600 V.32/42 EXT	300
Other Models	Call
Zoom	
2400 AFC Int	57
2400 AMC Int	46
2400 AMX Ext	60
VXU 32 Bis 14 4 EXT	228
Other Models	Call

DISK DRIVES

Conner All Models	Call
Imaging (Bernoulli)	
Beta 44 MG Transportable	976
Beta 44 MG Insider	871
20Mb Tri Pak (5.25)	177
44Mb Tri Pak (5.25)	276
Transitable Pro 90Mb	669
90Mb Tri Pak	373
Other Models	Call
Maxtor	
7120A	236
7120B	299
7120S	319
7213A	394
8760E/SH	1299
8760S/SH	1131
Micropos All Models	Call
Seagate All Models	Call
Teac 3.5 1.44 MG AT	54
Teac 5.25 1.2 MG AT	51
Teac 3.5/5.25 Combo Drive	134

SPREADSHEET

Lotus 1-2-3 Ver. 2.4	5332
MS Excel 4.0 Comp Upgrade	119
Plan Perfect 5.1	225
CA Supercalc	88

LIST MANAGEMENT

Avery Label Pro (Laser or Dot Matrix)	\$45
---------------------------------------	------

EDUCATION & GAMES

Bodyworks	\$40
Chessmaster 3000 (Windows)	35
Civilization	39
Kid Pix	39
Mavis Beacon Teaches Typing	30
Orbits	30
CD/Sherlock Holmes Detective	38

INTEGRATED

Lotus Symphony 3.0	\$480
MS Works	89
MS Works for Windows Comp Upg	71

OPERATING ENVIRONMENTS

Dr. DOS v6.0	\$64
MS DOS 5.0 Upgrade	60
MS DOS 5.0 OEM	50
MS Windows Ver. 3.1	91
MS Windows Ver. 3.1 Upgrade	49
MS Windows Ver. 3.1 OEM	39

PROFESSIONAL DESKTOP PUBLISHING

Freedom of Press DOS or Windows	\$235
MS Publisher for Windows	120
Pagemaker 4.0	499

PRESENTATION GRAPHICS

Corel Draw 3.0	\$387
CA Cricket Presents	119
Dratix Ultra v4.0	234
WordPerfect Presentations	279
Harvard Graphics 3.0	408
MicroGraf Designer	369

DATA BASE MANAGEMENT

Claris	
Professional Developer	\$444
Professional Developer Upgrade	162
Clipper	471
Dbase IV	489
FoxPro API Library Construction	306
FoxPro Data Kit	306
FoxPro Single User 2.0	486
Infoselect	87
Paradox 4.0	485
PC File v6.5	84
Q&A	247

FONTS

MS True Type Font Pak	\$49
-----------------------	------



VISIO™ FROM SHAPEWARE
Finally, a drawing program as accessible as your favorite word processor or spreadsheet program. Everyone can create business or technical drawings with Visio's intuitive drag and drop drawing technique - you don't have to be a graphic artist or draftsman.

\$196

PERSONAL FINANCE

Quicken 6.0 (DOS)	\$39
Wealth Builder	90

UTILITIES BACK UP

Back It 4 (DOS)	\$42
Central Point Backup (Windows)	87
Fastback Plus 3.1	93
Norton Backup 2.0 (DOS)	96

GENERAL

Copy II Option Board Deluxe	\$119
Copy II PC 6.0	35
Norton Antivirus	117
Norton Desktop (Dos)	117
SideKick v2.0	55
Super PC Kwik	48
WinMaster	49

HARD DISK MANAGEMENT

Check It Plus!	\$79
Norton Utilities 6.01	111
PC Tools 8.0	120
Spinrite II	53
Stacker v3.0	91
Stacker/AT	178
SuperStar 2.0	45
XTree Gold 2.5	88

MEMORY MANAGEMENT

386MAX 6.0	\$60
Memory Mate	39
Quem 386	58

MENUING SOFTWARE

Direct Access Windows	\$61
Power Menu Plus	61

PRINT

Sideways v.3.3	\$54
----------------	------

SCREEN SAVERS

After Dark	\$29
Intermission	27
Privo	32

WORD PROCESSORS

PFS First Choice	\$85
CA Textor	83
WordPerfect 5.1	263
WordPerfect 5.1 Upgrade	74
WordPerfect Office v3.1	82
Word for Word (Windows)	38



WINSLEUTH GOLD™

- Locate faulty RAM chips
- Get detailed disk drive and memory usage statistics in an easy-to-read graphical format
- Find out which programs are gobbling up Windows™ resources
- Use installation Assistant to help install new hardware
- Use Tune-Up to fine tune Windows™ performance

\$89

ACCOUNTING

ACCPAC BPI	
AP, AR, GA, INV Payroll	\$230
DAC Easy Bonus Pack	122
DAC Easy Payroll	58
Unit Write + Acct Works	119
Pacioli 2000	27
Peachtree Complete Accounting	177
QuickBooks	82
QuickBooks Quickpay Bundle	107
Quick and Easy Personal	29

COMMUNICATION

CoSession Remote	\$70
Close Up Dual Pak	119
Mac Link Plus	119
Norton PC Anywhere v4.5	115
Procom Plus v2.0	69
Prodigy Start-Up Kit 3.1	24
Winfax Pro v3.0	71

PROGRAMMING & LANGUAGES

Borland C++ App Framework	\$514
MS C/C++ v7.0 Upgrade	123
MS Macro Assembler	89
MS Quick Basic	59
MS Quick C	59
MS Prof Tkt for MS Visual Basic	183
MS Visual Basic (Windows)	121
Turbo C++ DOS	87
ToolBook v1.5	280

BUSINESS

AutoMap (DOS)	\$54
Instant Recall	84

POLICIES

- Order Line Hours: Mon-Fri 9am - 5pm, Sat 9am - 5pm, Sun 9am - 5pm
- In Arizona Call (800) 944-0402
- Order Processing (602) 944-1037
- 10am - 3pm Mon-Fri
- Mailing Address: Telemart, 8804 N. 23rd Ave. Phoenix AZ 85021
- International Orders - Fax (802) 944-1516
- International orders add 8%
- Order Today Get it Tomorrow, if we can't keep our promise, we will notify you
- Call Before Submitting P.O.'s Ask for National Accounts
- Personal and company checks will delay shipping 3 weeks
- Prices, terms, availability & specifications are subject to change without notice
- Add 5% for C.O.D. A.P.O. & P.O. Orders
- Money Back Guarantee: Software ONLY 30 days from date of invoice. Refund ONLY on Product Price. Call for Return Authorization Number. Must be in Original Packaging.
- No Charge for VISA and MasterCard
- We Do Not Charge Your Card Until Your Order is Shipped
- You Pay the Ground Shipping: 1 10# \$8.00 11 20# \$12.00 (Except Alaska & Hawaii)
- We Pay the Air Difference and Free Air Applies ONLY to Domestic orders up to 20 lbs and over 100#
- All products, including DOA's carry only manufacturer's warranties. We do not honor guarantees, rebates, trial period privileges or promotional programs offered by manufacturers.
- No returns on used or misordered product
- We do not guarantee machine compatibility
- Machine compatibility disclaimer does not apply to MITS systems

A DECADE OF EXPERIENCE DELIVERS

SHIPPING

Most orders shipped in 24 hours... with FREE Air Express

You pay the ground shipping, we pay the air difference!

PRICE

A decade of lowest prices on the products you want.

CONFIDENCE

We do not charge your card until we ship your order. 30 Day Money Back Guarantee on all software. No questions asked.

CONVENIENCE

Extended hours: late nights, Saturdays and Sundays.

SELECTION

When you see this symbol, you're assured that these products have been purchased most often by our national customer base, based on performance and the telemart price.

CALL US FOR CUSTOMIZED ACCOUNT SERVICES

International Orders: 1-602-944-3045
Fax 1-602-944-1510
Canada 1-800-752-0590

Purchase Orders: 1-800-521-1970

Dealers/VAR's: 1-800-521-1982

MIT Systems & Networks: 1-800-336-4310

VISA



1-800-521-1973

The Only Hardware You Need To Run Up The World's Ultimate SuperStack II

PRODIGY®

GEIE, Delphi

LA On-line

TurboTax 1040 for Windows

Now even complicated returns are easy — with TurboTax. Comes complete with over 90 forms, schedules, worksheets, IRS instructions, tax help in plain English, itemizations, and the EasyStep tax preparation system.



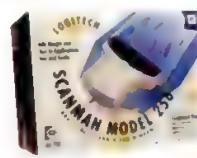
**Less \$5
manufacturer's
rebate...**
Your cost: \$42

Chip Soft, Inc.

\$47

ScanMan 256 +CatchWord® Pro

The premier image and text solution for Windows. Scan full pages — the Logitech™ AutoStitch feature automatically merges multiple scans into single images. CatchWord Pro is the fast, accurate, easy way to make scanned text usable in your applications. It recognizes almost all typefaces and sizes, and includes editing tools designed for OCR. Also includes FotoTouch™ image editing software.



Logitech
\$299

Lotus Ami Pro 3.0 Competitive Upgrade

The fastest, easiest way to create great-looking documents. Features an on-line QuickStart tutorial, colorful SmartIcons to access frequently used functions, Drag-and-Drop and Fast Format to easily manipulate and format text on screen. With an innovative design aimed at ease-of-use, AmiPro lets you create all of your documents in a lot less time with a lot less effort.



\$99

Zoom Technologies

The Zoom FaxModems — VFXV32bis and VFXV32 — provide 14,400 bps data and 9,600 bps data respectively. Also have send/receive fax capability and feature V.42bis data compression. MNP 2-5 and seven year warranties.



FaxModem 14,400 bps FaxModem 9,600 bps

\$249

\$229

Graphics Works for Windows

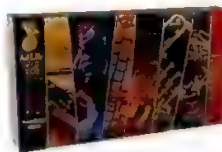
The ultimate graphics combination in one complete package. Eye-catching posters, stunning newsletters, compelling presentations — this program does it all. Combines the best aspects of Windows Draw, PhotoMagic, PM Chart, Windows OrgChart and the SlideShow function from Charisma, plus the largest selection of ClipArt and PhotoMagic images Micrografix has ever compiled in one package!



Micrognfx \$189

Ad Lib Gold 1000

A 22-voice stereo music system featuring two channels of sampling, 20 channels of FM synthesis, game port, MIDI interface and full Multimedia PCTM and original Ad Lib card compatibility.



\$179

Orders accepted on our toll free number Mon-Sat 8:30 to 5:30 EST. Visa, MasterCard, and Discovercard accepted. All credit card orders processed within 24 hours. Continental US shipments. UPS Ground \$5, Airborne Overnight \$7. Corp., Gov't., Educ., APO, FPO, International orders accepted. No sales tax except for Mass add 5%. Personal checks will delay shipment 5 business days. Products covered by manufacturer's guarantee. Defective software replaced immediately. No COD's. Item availability and price subject to change without notice. 15% restocking fee for non-defective returns.

COMPUTER
Express

The World's Ultimate On-Line Superstore
Available in DOS & Windows

800-228-7449
Fax: 508-443-5645

[illegible]

Here are only a few of the 3,000 products we've delivered to our satisfied customers. Just call 1-800-228-7448 to start saving time and money with Campbell-Europe.

Computer Express 31 Union Ave. Sudbury, MA 01776



WE ACCEPT P.O.'S
FROM QUALIFIED FIRMS

MEMORY

NO SURCHARGE
FOR MC, VISA & DISCOVER

★★ CALL TOLL-FREE 800-433-3726 ★★

★ LASER MEMORY SPECIALS ★

	256K 1mg	2mg	3mg	4mg	5mg
Panasonic 4410 4430		109		169	
Panasonic 4420 4450		109		169	
IBM 4029, 4019 4019E			139		
HP 220 330 3P 2P 2P+		104		164	
Epson Action Laser II	99		169		249
TI Microlasers (a)	49				
OKI 400		99			
HP DeskJet 500 500E	59				
Turbo 25 150 fonts for	69				
all HP Laser & Epson Action Laser II					
"We buy large volume of excess inventory."					

Individual D-RAM Chips

MEMORY FOR IBM & APPLE				
	60NS	70NS	80NS	100NS
1Meg x 1	4.45	4.15	3.95	—
1Meg x 4	24.00	20.00	18.00	—
1Meg x 4 (Zip Pack)	25.00	21.00	19.00	—
256 x 4	—	—	15.95	12.95
(Video Zip)	—	—	—	—
256 x 4	4.75	4.50	3.90	—
256 x 1	2.50	2.25	1.80	1.60
64 x 4	—	—	3.00	—
64 x 1	—	—	—	1.50

INTEL Math Chips

8087	49.00
8087 2	69.00
8087 1	89.00
80287-XL	74.00
80387 16	59.00
80387 20	65.00
80387-DX (Does All)	89.00
Intel SX (Does All)	89.00
Intel SL Mobil	99.00

SIMM MODULES (Add \$5** for SIPP)

	40NS	53NS	60NS	70NS	80NS	100NS
1Meg x 9	69.00	54.00	39.00	38.00	37.00	34.00
4Meg x 9	—	—	164.00	139.00	134.00	—
16Meg x 9	—	—	—	749.00	—	—
256 x 9	—	—	20.00	19.00	18.00	17.00
256 x 36 1Meg (72 PIN)	—	—	—	—	50.00	—
512 x 36 2Meg (72 PIN)	—	—	—	85.00	80.00	—
1 x 36 4Meg (72 PIN)	—	—	179.00	169.00	159.00	—
2 x 36 8Meg (72 PIN)	—	—	309.00	299.00	289.00	—
4 x 36 16Meg (72 PIN)	—	—	619.00	609.00	599.00	—
8 x 36 32Meg (72 PIN)	—	—	—	1475.00	1450.00	—

CYRIX FASMATH PROCESSOR

Programs executed up to 3X faster • Plug & object code compat w/Intel
PC Week • rated #1 over all math chips
5 Year Warranty
"All Downward Compatible"

AST MEMORY MODULES

MODEL#	AMT. UPGRADED	AST PART#	PRICE
Advantage 12 386	4Meg Kit	500510-004	Call
Bravo 486/25. 33	2Meg Kit	500780-005	Call
	8Meg Kit	500780-001	Call
Bravo 486	2Meg Kit	500987-001	Call
	4Meg	500987-002	Call
	8Meg Kit	500987-003	Call
	16Meg	500987-004	Call
	32Meg Kit	500987-005	Call
Premium 386/25. 16 SX	1Meg	500718-001	55.00
Premium 386/33	1Meg	500718-002	56.00
Premium II	1Meg	500780-003	WPB 60.00
386SX20. 486-25. 25E. 33	4Meg	500780-004	WPB 149.00
Premium Tower. 386/33TE. 486/25TE. 486/33TE	8Meg	500780-001	WPB 298.00

ZENITH MEMORY UPGRADES

MODEL#	AMT. UPGRADED	ZENITH PART#	PRICE
Z386/33. 25 20. 33E	1Meg	ZA3800ME	50.00
Z386/33. 25 20. 33E	4Meg	ZA3800MK	149.00
Z248. Z286LP Z386SX	2Meg	Z-605-1 modules	99.00

MAGNAVOX

286/386SX-16. 386SX-20.	
486SX 20 & 386-33	
all are 72PIN SIMM	
1MEG — 50.00	
4MEG — 149.00	
8MEG — 289.00	

DELL

420. 425. 433. 450. DE. SE. TE	
2/4Meg Kit — 129.00/199.00	
8/16 Meg — 319.00/619.00	
32 Meg — 1399.00	
Call on other Dell Machines	

IBM PS/2 SIMM MODULES

IBM PART NO.	WORKS WITH MODEL NO.	PRICE
30F5348 (512K)	30-286	30.00
30F5360 (2Meg)	30-286. 25-286. 50 MTHR BD	89.00
6450375 (1Meg)	80-041	79.00
6450379 (2Meg)	80-111. 311-121. 321. 081. 161	89.00
6451050 (4Meg)	80-A21. A 61. 80-A31. 80-111. 80-311	179.00
6450603 (1Meg)	35SX. 40SX. 55SX. Model 70 s. P 70	54.00
6450604 (2Meg)	70-061. E61. 121. 50Z. 55SX. 65SX. P 70	80.00
	55LS. 65LS. X-Station 120 & 130. 35SX. 35LS. 40SX	
6450608 (2Meg)	70-A21 A 61. B-21 B 61. 35SX. 35LS. 40SX	84.00
	Value Point 325T	
78X8955 (128K)	25	35.00
34F2933 (4Meg)	35SX. 40SX. 55SX. 65SX. 55LS. 65LS	149.00
87F9977 (4Meg)	55SX. 55LS. 65SX. 40SX. 35SX. 35LS	149.00
1057035 (512K)	P/S1	40.00
92F9935 (2Meg)	P/S1 & P/S1/386SX-2121	84.00
92F9944 (4Meg)	P/S1 & P/S1/386SX Model 2121	165.00
6450902 (2Meg)	56 57. 57SX 90. 95 P-75 57SLC	89.00
	Value Point 77 486DX2 486SX SVR 85	
6450128 (4Meg)	57SX 90 95 P-75 57SLC 56 56SLC	149.00
	P/S1 386SX Models 2123 2133 2155	
	Value Point 77 486DX2 486SX SVR 85	
6450129 (8Meg)	35SX. 40SX	289.00
6450130 (8Meg)	56 57. 57SX 90 95 P-75 57SLC	289.00
	Value Point 77 486DX2 486SX SVR 85	
79F0999 (2Meg)	LX40 N33SX PS Note	89.00
79F1000 (4Meg)	LX40 N33SX PS Note	149.00
79F1001 (8Meg)	LX40 N33SX PS Note	289.00
07G1826 (2Meg)/07G1827 (4Meg)	NS1 (all)	89.00/159.00
07G1828 (8Meg)	NS1 (all)	309.00
07G1419 (2Meg)	CL57LSX Color LpTp Thinkpad 700 700C	169.00
07G1420 (4Meg)	CL57LSX Color LpTp Thinkpad 700 700C	219.00
07G1421 (8Meg)	CL57LSX Color LpTp Thinkpad 700 700C	369.00
92F8804 (2Meg)	N45SL	99.00

COMPAQ MEMORY MODULES

MODEL#	AMT. UPGRADED	COMPAQ PART#	PRICE
DeskPro 386/33. 386/33L.	2Meg Module	115144-001	99.00
486/25 486/33L.	8Meg Module	116561-001	289.00
486/50L. System Pro	32Meg Module	116568-001	1500.00
DeskPro 386/33L. 486/33L	(Exp Bd)	116569-001	319.00
DeskPro 386/25 386/20	1Meg Module	113131-001	79.00
	4Meg Module	113132-001	179.00
DeskPro 386S 16MHz	1Meg Exp Bd	113633-001	110.00
	4Meg Exp Bd	113634-001	219.00
	1Meg/4Meg Module	113646-001/112534-001	75.00/179.00
DeskPro 386/20E	1Meg Exp Bd	113644-001	119.00
DeskPro 386/25E	4Meg Exp Bd	113645-001	219.00
	1Meg/4Meg Module	113131-001/113132-001	75.00/179.00
DeskPro 286N 386N	1Meg Module	118688-001	50.00
386SX/20 386/25M 486/	2Meg Module	118689-001	85.00
33M 486S/25M. 486S/16M	4Meg Module	118690-001	159.00
ProII 486C	8Meg Module	128877-001	319.00
DeskPro 386/16	1Meg Kit	108071-001	99.00
	4Meg Kit	108072-001	269.00
	108069-001/108070-001	239.00/399.00	
DeskPro 286	512K Kit	113012-001	59.00
Proline 4/33	1Meg/2Meg	141682-001/141683-001	55.00/99.00
	4Meg/8Meg	141684-001/141685-001	159.00/319.00

COMPAQ PORTABLES & LAPTOPS

Compaq SLT/286	1Meg Module	110235-001	79.00
	4Meg Module	110237-001	219.00
Compaq SLT/386	1Meg Module	118303-001	79.00
	2Meg Module/4Meg Module	118304-001/118305-001	109.00/179.00
Compaq Lite 286	1Meg Bd	117081-001	79.00
	2Meg Bd/4Meg Bd	117081-002/117081-003	99.00/219.00
Compaq Lite 386S/20	4Meg Module	121125-002	189.00
Compaq Lite Ltr/20. 25	4Meg Module	129769-002	189.00
Compaq Lite Ltr/20. 25	8Meg Module	129769-003	389.00
Compaq Lite Ltr/20. 25	16Meg Module	N/A	Call
Compaq Contura	2Meg/4Meg	139497-001/139498-001	89.00/169.00
386SL 320 325	8Meg/16Meg	139499-001/N/A	319.00/759.00

HEWLETT PACKARD

Apollo 9000/345 375 380 • 9000/400DL 400S 400T • 9000/425T 433T	
4Meg Kit H-982298 — 299.00	8Meg Kit H-98229C — 499.00
16Meg Kit H-982290 — 899.00	32Meg Kit H-98229E — 1699.00
Vectra 486S/20PC. 486/25T • 486/33T. 486PC	
1Meg D2150A — 59.00	4Meg D2151A — 159.00
Vectra 386/25PC. 486S/20PC. 486/PC. 486/25T. 33	
2Meg D2381A — 99.00	8Meg D2152A — 329.00

NEC POWERMATE

386/25S — 2Meg Kit/8Meg Kit — 199.00/619.00	
386/33E. 486/25E — 2Meg — 169.00	
386/33 — 1Meg/4Meg/16Meg — 69.00/149.00/699.00	
Express Te & E — 1Meg/4Meg/16Meg — 69.00/149.00/699.00	

TOSHIBA LAPTOP MEMORY

LAPTOP MODEL #	AMT. UPGRADED	TOSHIBA PART #	PRICE
T1000SE/XE/LE	2Meg	PC14 PA8312U	79.00
T2000/T2000SX	2Meg	PC18 PA8317U	79.00
T2000SX/T1000LE	4Meg	PC PA8314J	159.00
T2000SX/T1000LE	8Meg	PC14 PA8315U	299.00
T2000SX/2200SX/T1800 1850 C	2Meg	PC PA2000U	74.00
T2000SX/2200SX/T1800 1850 C	4Meg	PC PA2001J	159.00
T2000SX/2200SX/T1800 1850 C	8Meg	PC PA2002J	299.00
T4400SX SXC T6400	2Meg	PC PA2003J	129.00
T4400SX SXC T6400	4Meg	PC PA2004U	199.00
T4400SX SXC T6400	8Meg	PC PA2005J	349.00
T4400SX SXC T6400	16Meg	PC PA2010U	799.00
T3300SL	2Meg	PC PA2006U	119.00
T3300SL	4Meg	PC PA2007U	189.00
T3300SL	6Meg	PC PA2008U	289.00
T3300SL	8Meg	N.A.	369.00
T3300SL	16Meg	PC PA2009U	799.00
T1200XE	2Meg	PC13 PA8306	85.00
T1600	2Meg	PC8 PA8302U	85.00
T3100	2Meg	PC3 PA7135E	179.00
T3100E	2Meg	PC9 PA8340U	85.00
T3100SX	2Meg	PC15 PA8308U	85.00
T3100SX	4Meg	PC15 PA8310U	159.00
T3200	3Meg	PC6 PA7137U	159.00
T3200SX	2Meg	PC12 PA8307U	85.00
T3200SX	4Meg	PC12 PA8909	159.00
T3200SX	2Meg	PC19 PA8318U	84.00
T3200SX	4Meg	PC19 PA8319U	159.00
T5100	2Meg	PC7 PA8301U	89.00
T5200/18500	2Meg	PC10 PA8304J	94.00
T5200/18500	8Meg	PC10 PA8313U	279.00

BRANDNAME LAPTOP MEMORY

Leading Edge D/LT 386SX	1Meg		99.00
Bondwell B310 Plus	1Meg	23050 09100	99.00
Bondwell B310V SX	1Meg		99.00
NEC Prospeed 286 386SX 16	1Meg	PC21 21	105.00
NEC Prospeed 286 386SX 16	4Meg	PC21 22	189.00
NEC Prospeed 386	2Meg	PC31 21	129.00
NEC Prospeed 386	8Meg	PC31 22	419.00
NEC Prospeed 386SX 20	1Meg	PC43 21	109.00
NEC Prospeed 386SX 20	4Meg	PC43 22	219.00
NEC Prospeed 486SX. SX/L 1Meg/4Meg	OP	410-6204/6205	Call/Call
Sharp PC-6220	1Meg	CE 6218	85.00
TI Travelmate 2000	1Meg	2568034 0001	85.00
TI Travelmate 3000	2Meg	2566996 1	79.00
TI 4000	4Meg 16Meg		269.00/Call
Zeos 386SX Notebook	2Meg		79.00
Zenith Master Sport 386SX	2Meg	ZA 300-1	119.00
Zenith Master Sport SL SLE	2Meg	ZA 4 4	99.00
Zenith Super Sport			
286E 286E	1Meg	ZA 180 66	89.00
286E SX	2Meg	ZA 180 64	119.00
SX Alpha	2Meg	ZA 180 86	119.00
SX Beta	2Meg	ZA 180 87	119.00
Zenith Z Note 325	2Meg 8Meg	PCA3250-4/5	159.00/699.00
Everex Tempo LX. LX20	2Meg	PCA0053-0001	79.00
Everex Tempo Corner	2Meg	PWA 0884-A-J000	119.00
AST Notebook Prem Exec	4Meg	500814-003. 386SX/20/25/25L	129.00
Sanyo 17/18 NB	2Meg	MBC-NB/MEM2	79.00
Panasonic CF170. CF270. CF370	1Meg	CF BA165	54.00
Epson NB3	4Meg	AB08511	179.00
Epson NB/SL 20 25 25C	2Meg/4Meg/8Meg		129.00/219.00/Call
Tandon PC Brand Dataworld	2Meg 8Meg	NB386SX 20	89.00/319.00
AT&T Salan NSX/20	2Meg. 4Meg	PEC37650 37651	119.00/239.00
Packard Bell 386SX. 286	1Meg 4Meg	286. 386SX	89.00/199.00
Magnavox Metals	1Meg 4Meg	286. 386SX	89.00/119.00
Goldstar GS520 386SX/16	1Meg 4Meg	S386-1M S386-4M	99.00/249.00
Librex 286	2Meg		179.00
Chaplet NBA NTBK	2Meg 4Meg		Call
Dell 212 320N 320N+	2Meg	310-3204	119.00
Dell 325N 325NC	2Meg	310-3210	Call
H.P. 95LX Palmtop	128KB. 512KB. 1Meg. 2Meg	92.00. 149.00. 229.00. 429.00	

LASER PRINTER MEMORY UPGRADES

	1MEG	2MEG	4MEG
HP 2 20 330 3P 2P 2P+	—	104	16

PACIFIC WAVE

TECHNOLOGY

SPECIALIZING IN INTERNATIONAL ORDERS

COMPUTERS

IBM PS/2	
PS/2 Mod 70 161/A16	1699/1869
PS/2 Mod 90/95-486	
PS/2 700 C	4100

IBM PS VALUE (w/Mouse & Dos)	
386 SLC 25 0/80/170 Mb	835/979/1160
486 SX 25 0/80/170 Mb	1018/1240/1440
486 DX 33 0/120/210 Mb	1385/1598/1789

COMPAQ	
486 DX2 66 212 Mb	2489
Contura 3/25 60/120	1780/1900
Prolinea 120/240 W	Call
LTE SL/25 60/80/120	2460/2640/2995
LTE Color 80/120 Mb	Call/3795
DPro 486/50 M	Call
DPro 486/66 M	Call
DPro 486/33 M (All Models)	Call

TEXAS INSTRUMENTS	
Travelmate 3000 60/80/120	1595/1767/1925
Travelmate 3000 Win SX 60/80/120	1699/1850/2049
Travelmate TM 4000 SX/16 80 Mb	2150
Travelmate TM 4000 SX/25 120 Mb	2395
Travelmate TM 4000 DX/25 120/200 Mb	2795/3049

AST	
Bravo 486 DX/33 MDL 3V	1350
Bravo 486 DX 2/66	1979
Power Premium 386/33 MDL 3V	1699
Power Premium 486 DX 33 MDL 3V	1977
Power Premium 486-50 D MDL 3V	2130
Power Exec 386/25 SL 60/120	2150/2499
Power Exec 386/25 SL Color	Call

TOSHIBA	
T1800 60 Mb	1550
T1850 LCD 80/120/Color	1860/2075/2360
T2200	1899
T3300 SL 80/120	1975/2140
T4400 SX-80 LCD/PDP	2250/2325
T4400 SX-120 LCD/PDP	2450/2550
T4400 C	3395
T6400 SX/SXC	3499/5750
T6400 DX/DXC	4200/6450

PACKARD BELL	
Force 315 386 SX/25 107 Mb, 2 Mb	959
Force 325 386 SX/25 130 Mb, 4 Mb	1199
Force 545 486 DX/33 130 Mb	1699
Force 565 486 DX/33 210 Mb	1797
Force 600 486 DX/50 210 Mb	1899

MONITORS & TERMINALS

MONO/COLOR	
IBM 5151	250
Samsung 14" VGA Mono	129
Samsung Amber 12" TTL	85

VGA/EGA MONITORS	
IBM 8515/8518	560/499
IBM PS/1 VGA 14" Color	299
IBM 6312/6314/6319	415/510/530
MAG 15/17F	595/1089
Samsung Syncmaster 4 17"	775
NEC 3FG/4FG	619/739
NEC 5FG/6FG	1299/2360
Packard Bell VGA 8539/29/28	230/270/359
Panasonic 1381/95/1991	339/479/1599
Sony CPD 1304/1604S	599/1019
Zenith 1492	

VIDEO BOARDS

ATI Ultra Plus 1 Mb/2 Mb	295/339
ATI Ultra Pro 1 Mb/2 Mb	426/499
ATI Ultra Pro 2 Mb EISA/MCA	599
ATI Wonder XL 24 512 1 Mb	132/149
Diamond Stealth VRam	255
Diamond Speedstar 24/24k	149/159
Orchid ProDesigner II 512/1 Mb	186/230
Orchid Farenheit 1280 1 Mb	299
Paradise ACC/Windows	151
Monow Parallel Card	45

PRINTERS

CANON	
BJ 10 EX	294
BJ 20	399
BJ 300/330	430/599
BJC 800	1899
CITIZEN	
GSX 230.240+/145	259/339/399
PN 48 Professional	339

EPSON

Action Printer 2250/3250	135/195
FX 870	288
FX 1050	359
FX 1170	383
LQ 570	254
LQ 870	428

HEWLETT-PACKARD	
LaserJet 4/4M	1399/1975
LaserJet 3D/220 V	2349/1795
LaserJet 3Si	3300
LaserJet 2P+/3P	819/950

Toner & Cable included with all lasers	
DeskJet 500/550C	399/723
DeskJet Portable	399
Kodak 701 Portable	409
ScanJet II P	870
ScanJet IIC Color Scanner	1445
PaintJet XL 300	2279
HP Options	Call

FONTS & MEMORY	
Pacific Data 25-1 III/DeskJet	259/109
Pacific Data 1/2/4 Mb	89/120/175
Pacific Page PE/XL	289/671
Pacific Data Plotter in a Ctg	239
Compag 1/4 Mb Modules	118/275
IBM/T/ Toshiba AST	Call
CPI Superset 425+	219
CPI DeskRam 256k DJ500	89
CPI 66 Font DJ500	109

IBM (IBM & MAC)	
Laser Printer 5E/6	1159/1399
Laser Printer 10/10L	1499/2150
Laser Printer Options	Call
IBM 2390/2391	346/460
IBM 4070 InkJet	340

NEC	
Silent Writer 990	2499
Silent Writer 2 Mod 95	1399
OKIDATA (IBM & MAC) 220V Available	
ML 184	215
ML 320/321	324/435
ML 590/591	439/585
ML 393+ 393+color	919/999
Okilaser 400/810	590/1075
Okilaser 820/830/840	1276/1325/1549

PANASONIC	
1123 1180 L	214/160
1124/1624	291/349
1654 1695/2624	528/364/379
2123/2124	244/329
2180	181
4410/4430/4450/4455 Laser	649/899/1099/1750

TEXAS INSTRUMENTS	
PS 17 Laser	1198
PS 35 Laser	1316
MicroLaser Turbo	1563

TERMINALS

Wyse 50/60	375/300
Wyse 30/85	310/339
Wyse 150/185	289/379

SOFTWARE

All Mac Titles Available	Call
Aldus Pagemaker 4.0	495
Ashton Tate dBase III+/IV	419/479
Borland Quattro Pro 4.0	200
Carbon Copy 6.0	133
Compag/IBM DOS 5.0	89/125
Harvard Graphics 3.0/Win	370/325
Laplink Pro	103
Lotus 1-2-3 4/3 1	329/399
Lotus Windows 1 1	299
Microsoft	All Titles-Lowest Price
Microsoft DOS Upgrade	53
Microsoft Excel 4.0	295
Microsoft Office-Windows	455
Microsoft Windows 3.1	89
Microsoft Word-Windows	239
Microsoft Works-Windows	109
Norton Util 6.1	114
Procomm Plus V2	63
Quattro Pro	304
Quicken 6.0	38
Stacker 3.0	88
Ventura Publisher V 3.0	479
WordPerfect 5.1/Windows	260
1200 Additional Titles In Stock	

PLOTTERS & DIGITIZERS

HEWLETT-PACKARD	
7475A/7550B	1349/2699
7570A/7575A	2999/3350
7576 EXL	4150

SUMMAGRAPHICS	
Summasketch 2+ 12X12/12X18	289/515

CALCOMP	
Pacesetter 2024/2036	2899/3700
Digitizer 12X12/12X18	298/597

MULTIFUNCTION BOARDS CARDS & CHIPS

IBM 5250 Emulation	533
IBM 3278, 3279 Emulation	Call
Token Ring 16/4	625
AST 5251 Emulation	499
AST 6-Pack w/384 k	145
Intel AboveBoard Plus w/512 k	289
Intel 80387-SX	77
Intel 80387-DX	85
Cyrax Fasmath	Call

MODEMS & COMMUNICATIONS

ATI 9600 ETC	
Boca 14.4 Fax/Modem Int/Ext	219/275
CPI 2400 Internal	49
Everex 2400/2400 MNP	99/164
Hayes 2400/2400B	289/218
Hayes Ultra 96	529
Hayes Ultra 144	79
Practical Pocket Modem	99
Practical 14.4 Int/Ext	350/380
Intel 14.4 Ext	Call
MegaHertz Laptop Modems	Call
Supra 14.4 w/Fax Ext	299
US Robotics Cour HST	550/585
US Robotics Dual STD	760/779

FAX MACHINES

Hewlett Packard Plain Paper 200/310	999/1299
Intel Satsfaction 100/200	115/293
Intel Satsfaction 400/400E	395/437
US Robotics World Port 2496	259
MegaHertz Pocket 2400 S/R Fax	249
MegaHertz Pocket 96/96 SR	479

MICE

Logitech Mouseman	72
Logitech Scanman 32/256	139/260
Microsoft Mice+/Windows 3.1	92/144
Microsoft Ballpoint/Windows 3.1	115/144

DRIVES TAPES

Colorado DJ10/20	199/249
Colorado Tracker Parallel 120/250	345/414
Conner 40/80	185/215
Conner 120/210/360/540	300/459/809/909
Creative Labs Multimedia Upg Kit Int/Ext	546/606
Plus II XL50-105	228/375
Irwin All Models	Call
Mountain All Models	Call
NEC CDR 74/84 MPC	609/542
Panasonic LF 7010 1 Gb	
Erased Optical Drive	2740
Parallel Port Ext Floppy	175
Procom PS2 Hard Drive 120/200 Mb	Call
Sysgen Mobile Disk 40/80/124 Mb	319/419/527
Sysgen 21 Mb Floptical Drive KR	335

NETWORK

ARTISOFT	
Lantastic 2 Mb Starter Kit	338
Lantastic 2 Mb Adapter	139
Lantastic 10 Mb Starter Kit	469
Lantastic A3 Starter Kit	539
Lantastic 10 Mb Adapter	Call
NETWARE	
Netware 2.2 5-User	Call
Netware 2.2 10-User	1162
Netware 3.11 5-User	629
Netware 3.11 10/20-User	1350/1795
Netware 3.11 100/250 User	3699/6795
NE 1000/NE 2000	148/162
NE/2/NE 3200 (EISA)	249/687
SMC	
Archnet PC 130 8 Bit	99
Archnet PC 600 fs 16 Bit	220
Archnet PC 600 ws 16 Bit	139
Ethercard Plus Elite 16	155

Call for
our
12,000
item
Electronic
Price
Catalogue

1 (800) 348-4727



1 (800) 348-4727



0031-11-1865

通訳サービス



0014-800-128-943



0180-816218

Dolmetscher



0800-89-4935



For all other
countries, dial
80 887 51 100



In Hawaii (808) 875-1100
Shipping & Technical Assistance
(800) 875-1100
FAX (808) 875-1100
HOURS: 9:00 am - 6:00 pm CST
MON - FRI 10:00 am - 4:00 pm CST, SA
PACIFIC WAVE TECHNOLOGY
P.O. BOX 840312
DALLAS, TX 75284-0312

Most orders shipped within 48 hours / 24-hour worldwide order tracking / Printer orders received by 9 PM CST can be shipped same day All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, Carte Blanche, COD's, Wire Transfer. **TERMS & LEASE AVAILABLE** (one day approval) Credit cards not charged until product shipped. **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME** Allow 10 days for personal checks to clear. Prices reflect a 3 percent cash discount. Non-defective returns subject to a restocking charge. All warranties good through Pacific Wave Technology. Prices subject to change without notice. All freight charges to be incurred by purchaser for refused COD shipments. / Please allow 24 hours on large credit card orders



After 9 Years, We're Still Doggedly
Determined to Give the Best Doggone
Service and Prices to PC Users!

1-800-438-6039

Network

3COM	
3C503 Etherlink II/ 5-pack	189/799
3C503TP 10 Base T	229
3C505B Ethernet Plus	579
3C507 Etherlink 16	279
3C523 MCA Ethemet	299
ARTISOFT	
Starter Kit 2mbps/AE2	325/459
Starter Kit AE3	539
Lan Cards 2mbps/AE2	129/199
Lan Card AE3	229
Central Station	419
INTEL	
Ether Express 16TP/EISA	125/539
Token Express 16/4 ISA/MCA	499
Token Express 16/4 EISA	849
NOVELL	
Novell Lite 1 0/starter kit	69/409
Netware 2.2 5/10 User	519/1099
Netware V.2 2-50 user	1999
Netware 3.11 20/100 User	1699/3648
Netware 3.11-10 User	1375
NE1000/NE2000	129/155
NE 3200	689
Access Server	1595
SMC	
PC130/PC130E	75/99
PC600WS/PC600FS	129/299
Ethercard 8 bit/16 bit	129/149
Token Card 8 bit/16 bit	349/399
10 Base-T Card 8 bit/16 bit	185/205
3608TP 10BT concentrator	409
3512TP Ether 10BT conc.12 port	709
THOMAS CONRAD	
TC4045 18/4 Token Ring	499
TC6151-11 18 port smart hub	879
TC6242/TC6242-TP+	89/99
TC6245/TC6245-TP+	199/219

Network Software

Borland D Base IV LAN-1 user	229
Borland Quatro Pro V.4.0 networkable	319
Close-Up Lan User/8 user	249/479
Foxpro Lan 6 user	559
Lotus 2.4 server/node	559/339
Lotus 3.1 server/node	625/409
Norion PC Anywhere V.4.5 Lan	325
Peachtree Network Accounting	489
Procomm Plus Network 5 pack	325
UnTouchable Network	429
Word Perfect Office- 5 user	289
Wordstar 2000 LAN-3 pack	259
X Tree Virus Safe Lan	379
X Tree Net. for Unix	319/189

Software

Aldus Pagemaker	499
Carbon Copy/Close Up	129/109
Claron ProDeveloper	449
Clipper 5.0	489
Corel Draw	365
Obase IV 1.5	389
Foxbase/FoxPro	259/449
Framemaker	549
Freelance Plus	309
Harvard Graphics	369
Lotus 2.4/3.1 Plus	345/389
Lotus Symphony	469
Lotus for Windows	415
Smart Suite Bundle	449
Microsoft Windows 3.1/Word	89/219
Microsoft Word for Windows	299
Microsoft Excel for Windows	319
Norion Desktop for Windows	94
Norion Utilities 8.0	115
Norion AntiVirus	85
Peachtree III Complete DQ	189
Paradox	call
Q&A 4.0	219
Quattro Pro	289
Ventura Desktop Publishing	479
Word Perfect 5.1	255
Word Perfect for Windows	259
Wordstar 7.0/2000+	259/225

Notebooks

TEXAS INSTRUMENTS	
3000-60/80/120	2025/2195/2580
3000 Win SX-60/80	1750/2339
3000 Win SX/120	2699
TM4000 Win 4MB	
SX/16 w/ 80MB HD	2179
SX/25 w/ 120MB HD	2399
DX/25 w/ 120MB HD	2899
AST 386SX-20	
43V w/ 40MB +2MB	1955
63V w/ 60MB +2MB	2299
NEC	
Ultralite SX20 w/ 80	2539
Ultralite SX20 w/ 80	2539
Ultralite SX25 color w/ 80	4999
EPSON	
NBSL-20/25	1525/1775
w/ 60/80/120 MB HD	369/542/756

Monitors

NEC MULTISYNC	
3FGX4FG	689/755
PANASONIC	
1381/1395	329/439
1691-20" 1280x1024	1559
SAMSUNG	
Fiat White ML4571	119
CVB 4995 Syncmaster 2E	269
CVM 4987 Syncmaster 3E	299
CTX	
5468/5468NI	289/320
3436 Multiscan 28	399
1760 17 VGA.28	615
5439/5432	229/275
NANAO	
997/DU/9080I	869/1025
5501/5601	1149/1899
VIEWSONIC	
776rFS	1069/369/820

Video Cards

ATI	
VGA Integra 512K	89
Graphics Vantage 1mb	229
Graphics Ultra w/ 1MB	459
8514 Ultra Plus w/ 1MB	389
VGA Wonder XL24 w/ 1mb	149
BOCA	
Basic VGA/Super VGA	63/129
CARDINAL	
VGA 700/732 w/1MB	119/139
900 w/ 1mb/765	225/169
ORCHID	
Prodesigner II w/ 1 mb	185
Fahrenheit 1280 degree with 1 MB	289
VIDEO SEVEN	
1024i Plus w/ 512	95
V RAM II 1 mb	269
Win VGA w/ 1 mb	159

Modems & Fax

CARDINAL	
2400 INT/EXT	62/84
2400 INT/EXT w/MNP	89/99
9600 INT/EXT	249/279
96/24 Fax modem INT	89
HAYES	
Ultra 1.44 V.32	679
Ultra 9600 w/1	899
Optima 9600 V.32	339
HEWLETT-PACKARD	
Plain Paper Fax 200/310	999/1339
INTEL	
Satisfaction Modem 200/400	309/409
PRACTICAL PERIPHERALS	
9600 V 42 Int/Ext	269/279
1.44FX fax/modem Int/Ext	350/369
US ROBOTICS	
Dual 16 B HST ext w/ fax	799

Printers

CANON	
LPB4+/LBP8+	919/1499
BJ20/200	399/369
BJ 300/330	469/559
DIGONIX	
1808/701	299/439
EPSON	
FX870/FX1170	289/379
LQ570/LQ870	289/435
LQ1070/LQ1170	375/579
LQ2550	849
EPL8000	1295
DFX5000/8000	1269/2139
HEWLETT-PACKARD	
Laser Series IV/IIID	1459/2599
Laser HP/IIIP	869/1069
Desk Jet 500/500c	399/669
Desk Jet 550c	729
IBM Laser	
6/6P	1479/1625
10/10P	1749/2899
NEC	
Silentwriter 95	1489
OKIDATA	
1847/80	229/219
320+/321+	314/435
590/591	439/595
393+/393C+	919/999
400/810	599/1064
830/840	1259/1509
3410	1299
PANASONIC	
1123/1124I	199/275
1624/1654	399/539
2180/2123	175/255
1805/2624	369/379
4410/4450I	649/1079
4430/4455	909/1719
QMS	
PS 410/815	1529/2949
Color Script 100 model 10p	4999
LASER ACCESSORIES	
Upgrade for HP III 1 mb	79
Upgrade- HP III 2mb/4mb	109/179
Pacific Data 25-N-1	249
Pacific Page PE/PEXL	269/649
Pacific Connect 256K	249
Complete Font Library	249
Font Bank Cartridge 1.5 Mb	269

Mice & Misc.

Microsoft Mouse w/Windows 3.1	149
Microsoft Ball Point Mouse	118
Logitech Fotoman	525
Logitech Scan Man 256	269
TRIPLITE	
BC 250/400	119/165
BC 600 Lan/900 Lan	269/369
BC 1250 Lan	499

Bulldog Systems

Bulldog's Standard Configuration	
Dual Floppy Drives • Super VGA Card	
with 1 Mb RAM • 14" Color VGA	
Monitor (1024 x 768) • DOS 5.0 •	
Windows 3.1 • Mouse • 1 year	
warranty!	
386-SX/25 w/ 2 MB w/ 60 MB HD	1199
386-40 (64K CACHE) 4MB • 120HD	
	1369
486-33 (256K CACHE) 4MB • 210MB HD	
	2099
486-50 (256K CACHE) 210MB HD	
	3219

Call for other configurations

Drives

CONNER	
120 IDE 3.5/200IDE 3.5	329/499
OMEGA	
90 MB Insider/Transportable 579/689	
Dual 90 ext	1495
MAGNAVOX	
461RSEXT CDw/ software	369
MAXTOR	
7120A 130 mg	389
7213 A 210 meg	489
MICRO SOLUTIONS	
Backpack Ext. Floppy 1.2/1.44	189
QUANTUM PASSPORT XL removable	
120MB/240MB	699/669
SEAGATE	
ST3096A/3144A	249/329
SYSGEN-Mobile Disk	
40/60/120	399/569/649
FLOPPY DRIVES	
360K/1.2MB/1.44MB	59/59/59

Tape Drives

IRWIN	
Accutrak 120/250	189/239
COLORADO MEMORY SYSTEMS	
DJ10 120 Meg Int Jumbo	199
DJ20 250 Meg Int Jumbo	259
Trakker 120/250	319/439
QFA 700 Meg Int	719
MICRO SOLUTIONS	
80/250 Backpack	429

Memory Boards

AST	
Six Pack w/384K XT	129
Six Pack 286 w/0K AT	95
Rampage PC w/1 mb	285
ORCHID	
Ramquest 16/32 w/0K PS/2	199
Ramquest 8/16 w/0K XT/AT	129
ACCELERATOR BOARDS	
Orchid Tiny Turbo Xtra	179

MathCo

INTEL	
SX or DX	89
CYRIX SX16/20/25	77
DX33/40	95/125



BULLDOG
COMPUTER PRODUCTS

No charge for credit cards. Shipping and handling extra. Minimum \$50. APO & FPO addresses add \$10.00. Product warranties, offers, and claims are handled by the manufacturer. Units reserved or reserved as our stock during the 14-day trial only. For returns on used items, all return shipping is subject to a 15% restocking fee. Refunds exclude special order items. Some items only. Call 800-860-7364 for a Return Authorization number prior to returning any product. Shipping charges are not included. Bulldog cannot guarantee compatibility. All prices are 1% and are subject to change and availability. UK residents add sales tax.

CIRCLE 015 ON READER SERVICE CARD

MEMORY!

H. Co. has America's largest selection of memory!
And, we'll beat any USA advertised price.*



Memory is Cheap-but Only If you Know Where to Look. The Phantom Saves a Bundle on SMMS Truth in advertising-what a concept...

PC Computing, April 1992

Math Coprocessors

IIT

Part #	Price
2C87-20	\$70.00
3C87SX-16	80.00
3C87SX-20	80.00
3C87SX-25	80.00
3C87-25	90.00
3C87-33	90.00
3C87-40	119.00



intel

Part #	Price	Part #	Price
80487SX-20	\$485.00	82S87S-20	\$80.00
80387-33	95.00	83S87-25	85.00
80387SX-25	90.00	83D87-25	95.00
80387SX-20	90.00	83D87-33	95.00
80387SX-16	90.00	83D87-40	129.00
80387XL XLT	83.00		

Gyrix

Laptop Memory

TOSHIBA Memory Price		NEC Memory Price	
Added	Price	Added	Price
T1000SE/XE/LE	2MB \$95.00	UltraLite 286F	1MB MD \$129.00
T2000SX/SXE	4MB 195.00	Prospect SX-20	1MB BD 129.00
	8MB 355.00	Prospect SX-20	4MB BD 295.00
			1MB BD 99.00
T3100SX, T3200SX, SXL	2MB 89.00	386SX-16	2MB BD 219.00
	4MB 159.00		4MB BD 299.00
			2MB 159.00
T1200EX, T1600, T3100E	2MB 89.00	NEW UltraLite III	4MB 319.00
	3MB 149.00	NEW UltraLite SL/20	8MB 599.00
T5100	2MB 89.00		
T5200, T5200C, T8500SL	2MB 89.00		
	4MB 319.00		
	8MB 189.00		
T3100	2MB 139.00		
T4400, T6400, T3300SL	2MB 269.00		
	4MB 395.00		
	8MB 549.00		

IBM Memory Price		OTHERS Memory Price	
Added	Price	Added	Price
L40SX	2MB Mem \$109.00	AST Ext	1MB SIMM \$59.00
	4MB Mem 139.00	Notebook	4MB SIMM 149.00
	8MB Mem 299.00	Sharp	1MB BD 129.00

COMPAQ		OTHERS	
Memory	Price	Memory	Price
Added		Added	
Portable III	2MB Kit \$129.00	AST Ext	1MB SIMM \$59.00
Portable 386/20		Notebook	4MB SIMM 149.00
	1MB Kit 179.00	Sharp	1MB BD 129.00
	4MBEX 459.00	PC-6220 Notebook	
Portable	1MB BD 119.00	TITM2000	1MB BD 99.00
LTE286	2MB BD 99.00	TITM3000	2MB Kit 89.00
	4MB BD 189.00	Everex	2MB MD 99.00
Portable	1MB BD 179.00	Templ LX	
LTE386S/20	1MB BD 89.00	Panasonic	1MB CD 69.00
	4MB BD 219.00	CF 170.270, 370	
SLT/286	1MB BD 79.00	Epson	1MB UPG 99.00
	4MB BD 289.00	NBS3	4MB UPG 259.00
SLT/386		Tandon NB386	
	2MB BD 169.00		2MB 89.00
	4MB BD 219.00		5MB 299.00

DeskTop Memory Upgrades

Apple Memory Price		IBM Memory Price	
Added	Price	Works w/Model	Price
Mac Classic	1-3MBBD \$79.00	502,55SX,70-E61	1MB \$ 50.00
	2MB Kit 79.00	70-121,P-70	
Mac IIci,IIxi	1MB Kit 129.00	502,55SX,70-E61, 2MB	80.00
Mac Ilii	2MB Kit 149.00	70-121,P-70	
Mac Ilii	4MB Kit 179.00	55SX,65SX,55LS, 4MB	139.00
Mac Ilii	8MB Kit 399.00	34F3077	
Mac Ilii,IIxi	16MBKit 569.00	70-A21,A61,B21, 2MB	80.00
Mac Ilii	4MB Kit 189.00	B61	
Mac Ilii	16MB Kit 599.00	30/286	2MB 80.00
Mac SE,SE	4MB Kit 179.00	PS/1	2MB 90.00
30 Plus, II		80-041	1MB 79.00
IIcx,IIx		80-111,31	2MB 99.00
		80-A21,A31,A61	4MB 179.00
		90,95	4MB 149.00
		70,80	2MB BD 279.00
		50 & 60 Series	2MB BD 259.00
		PS/2 Model 57SX,90,95	

AST Memory Price	
Added	Price
Bravo 486/25	2MB Kit \$109.00
	8MB Kit 298.00
Prem 386 SX16 & 20, 25, 33	6MB Kit 298.00
Prem II SX/20	1MB Kit 55.00
SX/16	4MB Kit 149.00
Cupid Exp.	0K BD 219.00
Premium	1MB Kit 59.00
386C	4MB Kit 189.00
WKST & Bravo	286
Premium	512-2MB BD 6289.00
Fastram	512Upg 55.00
FastramKit	1MB Kit 59.00
Premium	4MB Kit 229.00
386	

CALL FOR RISC SYSTEM 6000 MEMORY!!

COMPAQ Memory Price		NEC Memory Price	
Added	Price	Added	Price
DP 386	2MB MD \$119.00	P.M SX	1MB BD \$169.00
33 486,25 33 &		Plus	4MB BD 399.00
System	8MB MD 319.00		8MB BD 719.00
DP 386	1MB BD 119.00	P.M SX/20	2MB CPU 179.00
20e,20 & 25e,25		UPG	2MB 239.00
	4MB BD 269.00	UPG & Exp	2MB 79.00
	1MB MD 89.00	UPG Kit	2MB Exp 189.00
	4MB MD 169.00		2MB 79.00
	1MB BD 119.00		
DP-386	4MB BD 269.00	P.M SX/16	2-8MB Exp 189.00
S/16	1MB MD 89.00		UPG Kit 79.00
	4MB MD 169.00		
	1MB MD 59.00		
DP 286N, 1MB MD 59.00			
386N, & 386SX/20			
	2MB MD 99.00		
	4MB MD 179.00		
	OK BD 89.00		
	1MB BD 239.00		
	4MB BD 479.00		
	8MB BD 799.00		

We Support Fully Compatible MEMORY For Most PC's AND LASER PRINTERS At The LOWEST PRICES!

GERMANY OFFICE: H.Co. Computer Products, Inc.
 Falkenstrasse 28 • 3000 Hannover 91, Germany
 TEL: 0511-458-2411 • FAX: 0511-458-2440

Due to the I.T.C. tariffs placed on Korean manufacturers, memory pricing may be higher than advertised.

CIRCLE 391 ON READER SERVICE CARD

Laser Printer Memory

Model	Memory Added	PRICE
H.P.Laserjet IIP, III, IID, HIP, II, IID	2MB Module \$105.00	
	4MB Module 165.00	
H.P.Laserjet IIIsi	1MB Module 50.00	
	4MB Module 140.00	
H.P.Deskjet	256K Module 59.00	
IBM 4019,4019e	2MB Module 119.00	
	3.5MB Module 189.00	
OKI Laser 400	1MB Module 89.00	
	2MB Module 119.00	
OKI Laser 800,820	2MB Module 129.00	
	4MB Module 199.00	
Panasonic 4450	1MB Module 119.00	
Panasonic 4420, 4451	2MB Module 119.00	
	4MB Module 199.00	
Panasonic 4455	2MB Module 159.00	
Epson EPL6000	2MB Module 109.00	
	4MB Module 179.00	
Epson Action Laser II	2MB Module 149.00	
	4MB Module 229.00	
T.I. MicroLaser, XL	1MB Module 59.00	

SPECIALS!

1X9-70 (3Chip)	\$32.00
1X9-70 (9 Chip)	\$36.00
4x9-70 (9 Chip)	\$125.00
1X8-70 (For Mac)	\$34.00
4x8-80 (8 chip)	\$115.00

Call for DRAM Pricing

Now Shipping KINGSTON

Convert your 286 to a 386

The SX/NOW Works with: IBM, AST, Compaq, Epson, HP, NEC, AGI

PS 2 Model 65SX

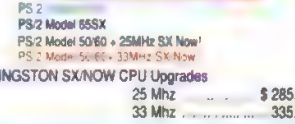
PS/2 Model 50/60 + 25MHz SX Now!

PS/2 Model 50/60 + 33MHz SX Now!

KINGSTON SX/NOW CPU Upgrades

25 Mhz \$ 285.00

33 Mhz 335.00



All Products 100% Guaranteed!

TERMS:

1. PO's accepted from universities, government agencies & qualified firms.
2. VISA MC AMEX COD pre-paid & approved PO's only, please
3. FAX orders accepted. International orders accepted
4. 15% Restocking fee on returns within 30 days. No refunds after 30 days
5. No Software returns.



H.Co. Computer Products, Inc.
 17922 Sky Park Circle #F
 Irvine CA 92714
 Office 1-714-833-3222
 Tech Support 1-714-833-3364
 FAX 1-714-833-3389

"Your #1 Choice for Memory Upgrades."

1-800-726-2477

"Order by 4 o'clock (PST) Guaranteed We'll Ship Today!"

OPEN WEEKENDS

* Any legitimate advertised price from companies with new merchandise actually in stock. Due to the I.T.C. tariffs placed on Korean manufacturers, memory pricing may be higher than advertised. H. Co. same day shipping guarantee applies only if parts are in stock. Offer excludes

PRINTER SHARING SOLUTIONS

EASY INSTALLATION AND OPERATION

Standard parallel interfaces make installation simple, and since the HWP supports both software and push-button control, it is easy and convenient to use.

FAST DATA TRANSFER

The HWP transfers data at speeds up to 180,000 characters per second. It can buffer large jobs sent from your PC faster than your printer can print them. Your PC can go on to the next task, whether or not a printer is available to it.

AUTOMATIC FUNCTIONS

Input switching and buffering are automatic, so with the HWP installed all your PCs print quickly and easily.

LARGE BUFFER CAPACITY

Buffalo H Series boxes offer buffer expandability from 256 KB up to 16MB to handle even the largest graphics projects.

OTHER ALTERNATIVES

Buffalo carries a complete line of computer resource sharing products, priced from \$175.



HWP256 \$295

CIRCLE 328 ON READER SERVICE CARD

TOLL-FREE TECHNICAL SUPPORT

Buffalo Technical Support provides friendly, effective assistance for installation and operation.

TOLL-FREE APPLICATION ADVICE

Our knowledgeable staff will help you select the right Buffalo Products, Inc. products to fit your needs.

ONE YEAR WARRANTY

45 DAY MONEY-BACK GUARANTEE

BUFFALO

US AND CANADA TOLL-FREE

1-800-345-2356

(503) 585-3414

FAX (503) 585-4505

Buffalo Products, Inc.

2805 19th St. SE, Salem, OR 97302

Response Code: M2HW1

BUFFALO is a registered trademark of Meico, Inc.

International Distribution

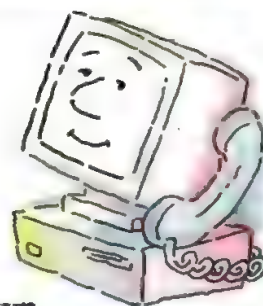
FAX 81-43-441-3417

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

On-site service and in-store technicians!

Think of it as 911 for your computer!



Call if your computer has an accident or just feels a little down.

- Monday through Saturday from 9am-9pm CST.
- It's available to you even if you didn't buy your computer from us!

Call 1-900-896-9393

The first minute is FREE with each additional minute only \$2. Call today!

COMP USA

THE COMPUTER SUPERSTORE™

15160 Marsh Lane • Dallas, TX • 75234

Now 33 locations nationwide to serve you in Atlanta • Boston • Chicago • Cincinnati • Dallas • Denver • Detroit • Houston • Kansas City • Los Angeles • Miami • Milwaukee • New York • Philadelphia • Phoenix • Providence • Sacramento • San Diego • San Francisco • St. Louis • Tampa • Washington D.C.

Expert technicians in-store during all store hours!

CIRCLE 144 ON READER SERVICE CARD

**GET NONSTOP
SYSTEMS
INFORMATION...**

**AND 2
DISKS -
FREE!**



**Call toll-free today:
1-800-289-0429**

Don't miss a single product report or productivity-enhancing tip — subscribe to PC Magazine today. You'll get 22 issues for only \$29.97 — that's 54% off the \$64.90 cover price!

Order now and you'll also get PC Magazine's "Power Utilities for the '90s" on 2 disks — **FREE** with your paid subscription! These state-of-the-art utilities for the new generation feature a modular menu, and Systems, Windows and Laptop enhancers to boot! This exclusive software is available *only* to new subscribers!

Basic one-year subscription \$44.97; on newsstands \$64.90. Canada and foreign add \$32.00. U.S. funds only. Canada GST included. Please allow 30 days for shipment of first issue. FREE disks will be sent upon payment.

Public Brand

P.O. Box 51315, Indianapolis, IN 46251

SOFTWARE CENTRAL

SAVE ON
TOP PROGRAMS
WITH OUR
SUPER LOW
PRICE!

BUSINESS/HOME

- ☐ **1992 Tax** (2 disks - 5002A) Prepare & print your federal taxes quickly and easily. Includes schedules & tax tips. (CGA)
- ☐ **APEX Stock Market Tools** (6 disks - 6877A) Graphical analysis program to help you stay bullish in the market. (CGA)
- ☐ **Brother's Keeper 5.0** (4 disks - 4153A) Explore your roots with this outstanding genealogy program.
- ☐ **DanCAD 3-D 2.5H** (5 disks - 1526A) Full-featured, high-res CAD/CAM program for creating 2-D or 3-D drawings & graphs. (CGA)
- ☐ **Drawing Pack** (2 disks - 1903A) Drawing & graphing programs compatible with Ventura & WordPerfect 5.0. (EGA & mouse)
- ☐ **Express Check 4.04 & More** (2 disks - 5005A) Simple yet powerful programs to manage your checkbook & personal finances.
- ☐ **FormGen II/FormFill & More** (2 disks - 2777A) Effortlessly design & print forms for business/home on any printer. Includes 48 ready-made forms.
- ☐ **General Invoice Sales Tracker Plus** (2 disks - 1452A) Comprehensive, easy-to-use invoice & billing program that provides accounting information, accounts receivable & other reports; prints invoices, statements & mailing labels, & much more.
- ☐ **Home & Business Legal Guide 7.5** (3 disks - 6554A) Attorney-written program generates over 120 personalized legal forms valid in 50 states.
- ☐ **Job Finder Pack** (3 disks - 4827A) Get the job you want! 5 job search programs including a great resume writer. (CGA)
- ☐ **Kitchen Helpers Pack** (4 disks - 4776A) 4 programs to organize recipes, plan meals, manage coupons & shopping lists. (CGA)
- ☐ **Names & Dates 4.2** (2 disks - 1853A) Powerful Personal Information Manager with address book, mailing list manager, date reminder & phone dialer.
- ☐ **Online Bible 5.0** (14 disks - 5129A) Complete KJV bible. Find & print any verse in seconds. Greek & Hebrew lexicon & cross-ref.
- ☐ **Painless Accounting 5.0** (4 disks - 1156A) Full-featured accounting for up to 10 companies. Includes companion utilities disk.
- ☐ **PC-Draft-CAD 3.06** (1 disk - 1527A) Excellent all-purpose CAD system. Automatic dimensioning, object rotation/scaling, & more. (CGA)
- ☐ **Print Partner 2.01 & More** (3 disks - 1900A) Print beautiful banners, calendars, signs! Plus a fun paintbrush program. (CGA)
- ☐ **Small Business Advisor 6.1** (2 disks - 1451A) The ins & outs of starting & running a small business, by an attorney & a CPA.
- ☐ **Sports Cards Databases** (2 disks - 4625A) Essential programs for tracking your sports card collection!

WORD PROCESSING

- ☐ **Thelma Thistlebottom, Grammar & Style Checker 5.08** (2 disks - 1756A) Scans WordPerfect 5.0/5.1 & ASCII documents to improve grammar, readability. (CGA)
- ☐ **Word for Windows 2.0 Power Pack** (3 disks - 1753A) 9 essential macros! Includes Word Counter & a utility to print up to 4 pages on a single sheet!
- ☐ **WordPerfect 5.1 Macro Pack** (2 disks - 1755A) Macros that make using WordPerfect easier & more productive.
- ☐ **WordPerfect 5.0/5.1 Supercharger** (2 disks - 1750A) Convert documents to & from leading WP formats, plus set up a file folder system in WordPerfect.

GAMES

- ☐ **Commander Keen Pack** (5 disks - 4403A) From Apogee's famous graphic adventure series: Commander Keen, Goodbye Galaxy & Keen Dreams. (EGA)
- ☐ **Cosmo's Cosmic Adventure** (2 disks - 4404A) Another fantastic graphic adventure from the game masters at Apogee! (EGA)
- ☐ **EGA Super Game Pack 1** (4 disks - 8104A) Caddiehack golf, Star Trek simulations & more! (AT)
- ☐ **EGA Super Game Pack 2** (4 disks - 8105A) More than 10 games including Tetris clones, War board games!
- ☐ **EGA Super Mouse Solitaire Pack** (4 disks - 4077A) The best EGA mouse solitaire games! More than 10 in all.
- ☐ **Gigglebytes!** (3 disks - 4575A) Over 50 different humorous programs & harmless practical jokes for your PC. (CGA)
- ☐ **Monochrome Super Arcade Pack** (2 disks - 1251A) Versions of Pac Man, Centipede, Tetris & 18 others.
- ☐ **Solitaire Dynamite Dozen** (3 disks - 4075A) If you like solitaire, you'll love these! 13 different games! (CGA & mouse)
- ☐ **Super Arcade Game Pack** (4 disks - 1250A) Over 30 action-packed versions of your favorite arcade games! (CGA)
- ☐ **Super Windows Game Pack 1** (4 disks - 4001A) More than 30 great games, including Video Poker & Klutz. (EGA)
- ☐ **Super Windows Game Pack 2** (4 disks - 4002A) 20+ favorites, including BattleGrid (BattleShip clone) & Black Breaker. (EGA)
- ☐ **Super Windows Game Pack 3** (4 disks - 4003A) Casino excitement at home! Includes Blackjack, WinSlot, SANF Casino Poker. (EGA)
- ☐ **Super Windows Game Pack 4** (3 disks - 4004A) WinChess, Backgammon, Bogo, & over 15 others! (EGA)
- ☐ **VGA Showcase** (4 disks - 8114A) 17 colorful animations, fireworks, aquarium images to spice up your VGA display! (mouse)
- ☐ **VGA Super Game Pack 1** (4 disks - 8106A) The shareware classic Moria, arcade games, & much more! (AT & mouse)
- ☐ **VGA Super Game Pack 2** (2 disks - 8107A) Includes Moroff's World, arcade games, adventure games. (AT)
- ☐ **VGA Super Mouse Pack** (4 disks - 1254A) Hours of fun for you & your mouse! (AT)
- ☐ **Wolfenstein 3-D 1.1** (2 disks - 4406A) Hot new Apogee adventure game challenges you to infiltrate a Nazi fortress! (VGA)

EDUCATIONAL

- ☐ **Astronomy, Chemistry & Fun** (2 disks - 8108A) Earth Centered Universe, a Windows stargazer program, plus a molecular modeling program for Windows. (AT, EGA & mouse)
- ☐ **Explore the Earth & Stars** (2 disks - 8109A) Skyglobe stargazer system & Geoclock geological clock program! (CGA)
- ☐ **High School Education** (4 disks - 2275A) 12 engaging programs teach Algebra, geography & chemistry. Fun! (VGA)
- ☐ **SAT Verbal Prep Pack** (3 disks - 8113A) Improve vocabulary, spelling skills. Includes programs suited for SAT preparation. (CGA)
- ☐ **Super DOS Learning Pack** (4 disks - 8110A) 4 programs to help you learn, understand & get more out of DOS. (CGA)
- ☐ **Super Math Learning Pack** (4 disks - 2125A) Over a dozen fun-filled programs that strengthen basic math skills. (CGA)
- ☐ **Toddler Teacher** (3 disks - 2452A) Pre-schoolers love these 11 delightful educational programs. (EGA & mouse)

UTILITIES

- ☐ **Amortization Pack** (2 disks - 6742A) Every loan calculator you'll ever need! (CGA)
- ☐ **LaserJet Superchargers** (4 disks - 6100A) 14 programs for HP LaserJets. Font loaders, fonts, Epson emulator, more. (CGA)
- ☐ **"Must Have" DOS Utilities** (4 disks - 8116A) Over 30 essential tools that pick up where DOS leaves off.
- ☐ **PC Magazine Utilities Pack** (2 disks - 6175A) A Public Brand Software disk special! As featured in PC Magazine, 16 great DOS & Windows utilities commissioned and selected by PC Magazine's editors.



- ☐ **Super Label Pack** (3 disks - 8111A) Create all types of labels, envelopes, letterheads & more. 8 powerful, easy-to-use programs. (CGA)
- ☐ **Screen Utility Pack for EGA/VGA** (4 disks - 8117A) Special package of 19 programs changes screen palette, adds new screen fonts, blanks screen & more.
- ☐ **Screen Utilities for Mono/CGA** (1 disk - 6026A) For preserving & better utilizing your monitor or safeguarding sensitive data from prying eyes, this baker's dozen can't be beat.
- ☐ **Super Virus-Fighter Pack** (4 disks - 6275A) 7 of the best shareware anti-virus programs you'll find anywhere.

WINDOWS APPLICATIONS

- ☐ **Graphics Grab Bag for Windows** (4 disks - 8115A) A slide show system, animation program, plus 6 games you'll love. (VGA)
- ☐ **Icon Management Pack** (3 disks - 6380A) 9 excellent programs to manage & draw icons, create DLL files & more!
- ☐ **Icons Galore!** (3 disks - 6381A) - Over 2,000 icons!
- ☐ **Metz Utilities** (2 disks - 6375A) Programs no Windows user should be without! Desktop Manager, FreeMem & 6 more! (EGA)
- ☐ **MultiLabel 2.0** (1 disk - 6805A) Make beautiful labels in Windows! WYSIWYG design, Windows fonts, BMP graphics.
- ☐ **"Must Have" Windows Utilities 1** (4 disks - 6377A) 20 programs designed to supercharge & simplify Windows! (EGA)
- ☐ **"Must Have" Windows Utilities 2** (3 disks - 6378A) 21 more programs that all Windows users need. (EGA)
- ☐ **Windows Business Pack** (4 disks - 8135A) The acclaimed Above & Beyond Windows appointment book & financial calculator! (AT)
- ☐ **Windows Graphics Tool Kit 1** (4 disks - 4276A) 9 programs for viewing, dithering, converting & printing .GIF, .PCX, .RLE, .JAC & most other graphics files. (EGA)
- ☐ **Windows Graphics Tool Kit 2** (4 disks - 4277A) Paint Shop Pro & 2 other top-rated programs for viewing & manipulating graphics such as .GIF, .BMP, .PCX, etc.

TRUE TYPE FONTS FOR WINDOWS

These new high-quality fonts take seconds to install & work with any printer.

- ☐ **True Type Volume 1** (4 disks - 2901A) 16 great fonts!
- ☐ **True Type Volume 2** (4 disks - 2902A) 16 more great fonts!

Basic System Requirements: 640K RAM and a hard disk. CGA=CGA graphics, EGA=EGA graphics, VGA=VGA graphics, AT=AT compatible computer. Shareware programs require separate payment to the authors if found useful.

\$3.50*
10 disks or more

\$4.00*
1-9 disks

MONEY-BACK GUARANTEE.
Disks guaranteed unconditionally.

Plus FREE catalog of over 300 programs with every order or by request.

No surcharge for 3 1/2" disks.

* Prices are per disk, not per program.

TO ORDER CALL TOLL-FREE 1-800-426-3475
or mail this page to P.O. Box 51315, Indianapolis, IN 46251; fax to 317-856-2086

Name _____

Business/Company _____

Street/P.O. Box _____

City/State/Zip _____

Phone _____

Method of Payment ☐ Check/Money Order ☐ MasterCard/Visa/American Express/Discover

Credit Card # _____ Exp. Date _____

Signature _____

Disk Size _____ ☐ 5 1/4" ☐ 3 1/2"

No. of Disks _____ x _____ = _____

\$3.50 (10 or more disks); \$4.00 (1-9 disks)

Sales Tax _____

Shipping _____ \$4.00

Special Shipping** _____

TOTAL _____

* Sales tax applies in the following states: Canada 7%; CA 7.5%; CO 3%; CT 6%; GA 6%; IL 6.25%; IN 5%; KY 6%; MA 5%; NH 6%; NJ 6%; NY 7%; OH 6.25%; PA 6%; TX 8.25%; VA 7.5%; WI 5.5%.

** UPS Next-day air (add \$10); UPS Second-day air (add \$5)

(required for credit card orders)

Code A2

PC MARKETPLACE

I N D E X

Windows

An every-issue four color section featuring quality products for the Windows environment.

444-445

Premier

The color showcase that puts the spotlight on leading-edge PC products and services.

439-444

Classified

Flexible-format display advertising: computer systems, components, software and more.

446-457

BusinessCard

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

458-461

Windows Premier Classified

HARDWARE

Boards/Components/Chips	445	440	446
Communications			
Computer Systems			446
Input/Output Devices		440	447
Mass Storage Devices		440	449
Midi			
Networking		442	
Security			
Video		442	

SOFTWARE

Business Applications	445	443	449
Communications	445	443	
Education			449
Graphics/Design		443	450
Multi-Media	445	444	450
Personal			450
Public Domain/Shareware			450
Scientific			
Security			450

Windows Premier Classified

Systems/Languages			
Utilities	444		451
Vertical Applications			
Adult		444	452
Windows			

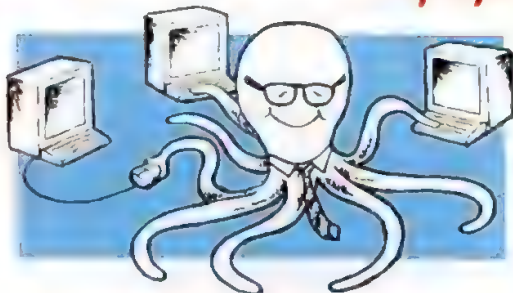
SUPPORTING PRODUCTS

Information Resources	444		453
Services			453
Supplies			454

Windows Premier Classified

PC-EXPANDER PLUS™

by cybex



Connect up to 8 VGA Monitors, Mice and Keyboards to a Single PC

- PC/AT, PS/2 and 100% Compatibles
- VGA up to 1024 x 768 Resolution
- Selectable Takeover Delay
- Use either PS/2 or Serial Mice



Made in USA

Dealer Program Available

Cybex Corporation

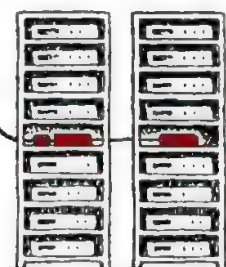
2800-H Bob Wallace Ave. • Huntsville, AL 35805 U.S.A.
(205) 534-0011 • FAX (205) 534-0010

CIRCLE 1001 ON READER SERVICE CARD

COMMANDER

by cybex

CONTROL UP TO 96 PC FILE SERVERS WITH 1 KEYBOARD, MONITOR, AND MOUSE



- Select via Keyboard
- Dual access up to 250 feet away (optional)
- "AutoBoot™" Feature boots attached computers without operator intervention
- Use either PS/2 or Microsoft serial mouse with available cables
- Each unit accommodates from 2 to 8 PCs; cascade up to 12 units



Cybex Corporation

2800-H Bob Wallace Ave. • Huntsville, AL 35805 U.S.A.
(205) 534-0011 • FAX (205) 534-0010
Dealer Program Available Made in USA

CIRCLE 1002 ON READER SERVICE CARD



BLAST YOUR MESSAGE THRU!

Voice Mail • Telemarketing • Call Processing

Transform your PC/XT/AT/386 into a multi-line processing command center. intelligently process your sales, inquiries, and messages. Complete package.

Multi-Line (Voice Solution) \$995
SINGLE LINE (BgmDuth) \$295

For Sales or Information
Call 1-800-934-4884

CALL (510) 522-3800 • FAX (510) 522-5556
TALKING TECHNOLOGY, INC.
1125 ATLANTIC AVE. • ALAMEDA, CA 94501

© 1992 Talking Technology, Inc.
(Developer/OEM packages available)
VISA - MC - AMEX - CDD

CIRCLE 1003 ON READER SERVICE CARD

Money Back Guarantee & 1 Yr. Warranty

Popular Space-Saver Keyboard \$98.00

Saves 60% desk space. Footprint 27.3 x 15.2 cm. 100 full-travel tactically responsive keys. Standard left-right spacing for easy touch typing. IBM XT/AT PS 2 compatible. Many language versions available.



Call Toll Free To Order: 1-800-DATALUX

DATALUX

- VISA, MC, AmX -

155 Aviation Dr. • Winchester, VA 22602
Tel 1-703-662-1500 • FAX 1-703-662-1682
Auto-FAXed Specs FAX 1-703-662-1675

CIRCLE 1006 ON READER SERVICE CARD

ANNOUNCING Computer Select™

The Most Complete
Database of Computer
Product Information
Available

With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

Discover the power of this new CD-ROM product. Call

now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$995.*

LIBRARY™

One Park Avenue,
New York, NY, 10016

**CALL NOW FOR A FREE
DEMONSTRATION DISK
212-503-4400**

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.
*U.S. and Canada only. Outside U.S. \$1195

Largest Selection of Tape Products

PE 9-Track ♦ GCR 9-Track ♦ 3480 Cartridge
TK50/70/85 ♦ 4mm & 8mm ♦ 1/4 Cartridge

**SALES, RENTALS, TECHNICAL SUPPORT,
CONVERSIONS, SERVICE/REPAIRS**

Call for Competitive Pricing!

1-800-362-6250

FAX: 301-330-9510
Gaithersburg, MD



**INTERFACE
SYSTEMS
INC.**

CIRCLE 1007 ON READER SERVICE CARD



ONLY ONE THING COULD BE EASIER THAN OUR BAR CODE PRINTING SOFTWARE.

All StrandWare form and label generation software packages are easy to learn and easy to use. Like newly-upgraded Quick Draw, with mouse driven pull-down menus, and laser down-loadable bar codes for fast printing of Zip + 4 Postnet and most popular bar codes—all for just \$259. Or try other StrandWare bar code printing software products, including Label Matrix, Power Label and Bar Code Library. Call (800) 552-2331 or fax (715) 833-1995 to find out more.

The Computer Connection
StrandWare
For Anyone Who's Keeping Track

© 1992 StrandWare, Inc.

CIRCLE 1005 ON READER SERVICE CARD

Tape Backup System for DOS. 1.0 Gigabyte-1/4-inch Tape Cartridge



If your data is too valuable to keep in only one place and your time is too important to devote hours to making backup copies on individual disks or multiple tapes, then Qualstar's TS/1000 backup system is the perfect solution. With a 1,000 megabyte capacity, you'll have plenty of room for future system growth.

The TS/1000 is a complete solution! The system includes an external tape drive, SCSI-2 host adapter, cables, tape, Qualstar's exclusive QBACKUP DOS software and, of course, complete documentation. It's ready to plug in and be productive right from the start.

Features:

- QIC-1000 tape format standard
- High speed operation (10 megabytes/minute typical)
- Highly-reliable linear recording technology
- Full mouse support with pull-down menus and help
- 80,000 hour MTBF
- Screen oriented or command line user interface
- Byte-by-byte or partial verification

QUALSTAR®

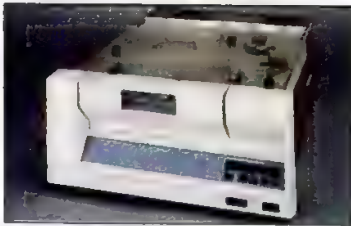
Dealer
Inquiries
Welcome

Qualstar Corporation 9621 Irondale Avenue Chatsworth, CA 91311
FAX: 818 882-4081 Telephone: (818) 882-5822

CIRCLE 1008 ON READER SERVICE CARD

9 TRACK TAPE DRIVES 3480 TAPE DRIVES FOR PC/XT/AT/386/486/PS2

**LOWEST
PRICES
BEST
QUALITY**



LAGUNA DATA SYSTEMS

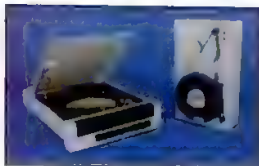
23151 Alcalde Drive
Suite B-3
Laguna Hills, CA 92653



(800) 886-4827
714-586-3010 TEL.
714-586-5538 FAX

CIRCLE 1009 ON READER SERVICE CARD

BEST 9-TRACK TAPE SOLUTION OF THE 90'S!



- PC 286/386/486
- RISC/6000 • AS/400
- SUN • HP • DEC • APPLE

Our name begins with Quality!
Call us today for
price and information.

QUALSTAR®

9621 IRONDALE AVE., CHATSWORTH, CA 91311
FAX (818) 882-4081 • (818) 882-5822

CIRCLE 1010 ON READER SERVICE CARD

PS/2 Storage Blues?



**DISKS
TAPES
OPTICALS**

2ND INTERNAL DRIVE

- 2nd drive mounts in spare floppy bay
- Built in OS/2 support
- Fast SCSI-2 support
- Up to 1GB capacity
- 10 to 15ms access time
- Everything you need for easy installation

Perisol

PERISOL TECHNOLOGY
800-447-8226 FAX 408-988-4431
408-988-2232 Dealer Inquiries Welcome

CIRCLE 1012 ON READER SERVICE CARD

NEW!

PORTABLE

WORLD'S SMALLEST

New Low Prices

DATA STORAGE

Battery, PS, Charger, & Parallel port inside.
Mac or IBM No cards needed!



60-120MB HD Use
alone or with base
battery for portability



340MB-1Gig HD



128/256MB 3.5" Cart Read/write
Optical. State of art



60-120MB HD
w/6hrs battery



2-8 Gig DAT compression,
600MB Tape, or 180MB Tape



44MB or 88MB Syquest Cart. Drive



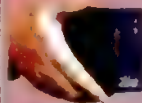
Optical 20MB cart.
3 hr. Battery optional



Sony CD-ROM
NEW High Performance



Single 2Gig. or
Dual Bernoulli, Syquest, CD,
rw Optical or any combination.



52-240MB HD, 155
Tape, Battery optional.



90MB Bernoulli Cart. Drive
1/3 size of regular.



1000MB very fast Maxtor
rw Optical Cartridge Drive
Solid State 64-384MB
available in same size as above.

Liberty
Systems

(408) 983-1127
Fax (408) 243-2885

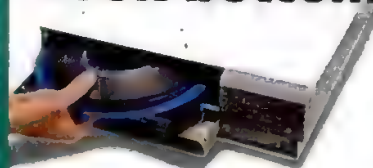
You're ready to work anywhere there's a computer. Send large documents and graphics between locations. Create a multimedia show and take it on the road. There's no other way you will find for these small wonders. Microsoft, MACWORKS

CIRCLE 1011 ON READER SERVICE CARD

9-Track

Mainframe to PC data interchange

**Rock solid solutions,
Rock bottom prices.**



For PCs and
workstations.
Direct from the
manufacturer.

800-729-8725

Finally, you get subsystems designed from the ground up to be ultra-reliable, light, compact and **inexpensive**. Supporting 1600 and 6250 bpi. Including the latest Overland Data software and expert help when you need it. Call today for more information and a free demo disk.

OVERLAND DATA® Since 1980

**3480 Now
With IDRC!**

Tel: 619-571-5555 • FAX: 619-571-0982
Europe: Tel: (+49) 6172-35027 • FAX: (+49) 6172-35028

Ask about 3480 tape drives too

CIRCLE 1013 ON READER SERVICE CARD

3480 800/842-0708
TDX
PERIPHERALS
 HAUPPAUGE, NY • 516/273-5900
The Only Professional Choice

Excellent Software and Support
 All Densities—including 6250
 Super Speed & Reliability
 3480 Cartridge Drives
 & SCSI Too!

FAST 9-TRACK for MICRO'S

CIRCLE 1014 ON READER SERVICE CARD

DOS

FREE ISSUE! *Inside DOS* is guaranteed to help you get the most out of DOS. But don't take our word for it. See for yourself.

Subscribe today and you'll get 13 issues for the price of 12 for only \$39! If you decide *Inside DOS* is not for you, mark "cancel" on your invoice and return it. Your free bonus issue will be yours to keep with no further obligation.

Call for your FREE ISSUE today!
1-800-223-8720
 Please mention code V5NY

VGA makes it to the
BIG SCREEN

VGA Mate®

Experience the freedom of viewing your presentation on a giant TV in brilliant colors

\$169

With a little imagination the applications are endless

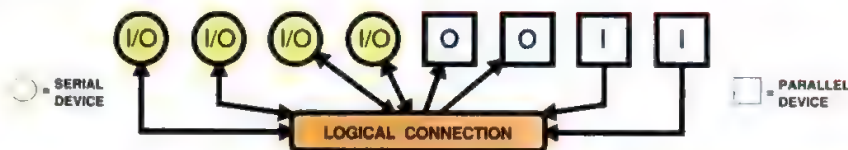
Product upgrade guaranteed for one year

NTSC & PAL switchable

Calpac Computer Corporation
 53 Moody Court
 Thousand Oaks, CA 91360
1 800 800-7222

CIRCLE 1016 ON READER SERVICE CARD

LOGICAL PRINTER SHARING



LCX-1000 1Mb \$595
 4 serial I/O, 57,600 bps
 2 parallel in, 2 parallel out

LC-512Kb \$495
 4 serial I/O, 19,200 bps
 2 parallel in, 2 parallel out
Many New Features!

LC Jr.-256Kb \$239
 Up to 115,200 bps
 4 serial in, 1 parallel out

LC-41PAS \$90
 Smart-switch
 4 in / 1 out, all parallel
 Requires no power supply

SPPS \$60
 Up to 115,200 bps
 Serial / Parallel Converter
 Requires no power supply

PB-42PP-256Kb \$250
 4 in / 2 out, all parallel
 Upgradable to 4Mb

Logical Connection, Inc.
 4660 Portland Road NE #108
 Salem, OR 97305-1697

Customer Support:
 (503) 390-9375
 FAX: (503) 390-9372

800-238-9415

CIRCLE 1015 ON READER SERVICE CARD

Flowcharting... with a template and pencil? Not!

If you're one of the many individuals frustrated by the thought of drawing flowcharts by hand, relax.

Discover what 150,000 users worldwide already know: Creating flowcharts, organizational charts and data flow diagrams is both fast and easy with EasyFlow by HavenTree. And, with a host of Alternate Shape Libraries available as add-ons to EasyFlow, the possibilities are endless.

But we don't stop there. HavenTree now offers EasyFlow for the Mac. That's right! Now you can have complete cross-platform compatibility.

Sharing documents between DOS users and Mac users is as easy as clicking a button.

EasyFlow
by HavenTree
Now available for
the PC or the Mac

See your dealer today
or call now:
1-800-267-0668
(In Canada: 613-544-6035)



HavenTree
SOFTWARE

HavenTree Software Limited
PO Box 404
Timoneau, NY 16141-0404

CIRCLE 1017 ON READER SERVICE CARD

If You Need to Communicate...



Sample of VT-340 graphics, configurable author, and keyboard mapper.

DynaComm 3.1 includes:

- ◆ DEC VT-340
- ◆ 16 terminal emulations
- ◆ 19 network connectors including TCP/IP
- ◆ 10 transfer protocols
- ◆ 300+ script commands
- ◆ Technical support

And who doesn't? Today's fast moving corporate world demands quick, easy access to mainframes, minis or other PCs. DynaComm provides the most powerful WINDOWS™-based communication features.

Microsoft agrees: they selected DynaComm as their world-wide standard for data communications. So if you need to be in touch with the rest of the world or just the rest of your company...

...We Need to Communicate.



FutureSoft.

1001 South Dairy Ashford, Suite 101 • Houston, Texas 77077
713 496-9400 • 713 496-1090 FAX

1-800-989-8908

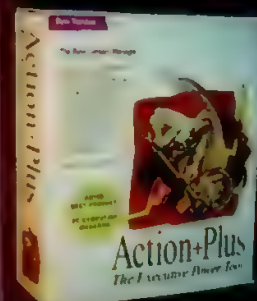
Retail \$249 (Network pricing available)

WINDOWS is a trademark of Microsoft Corporation.

FutureSoft and DynaComm are registered trademarks of FutureSoft Engineering, Inc.

CIRCLE 1019 ON READER SERVICE CARD

Clean Up Your Act with



The BEST Contact Management
Personal Information Manager
Time Manager- Franklin & DayTimer
Invoicing, Sales Orders, Statements
Sales Performance Graphs
Inventory w/ Serial Number Tracking
Word Processor / Merge / Spell Checker
On-Line Tutorial & User Manual
Graphic Image Display
Speed Dialer - E-Mail
Goals & Project Planning
Expense Tracking
\$495.00 Single-User \$1495.00 Network

Action Plus Software, Inc.
935 East 7220 South - D-100
Salt Lake City, UT 84047-2393
(801)255-0600 FAX (801)255-0642

Available at Egghead & BizMart

CIRCLE 1018 ON READER SERVICE CARD

ANNOUNCING Computer Select™

With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

Discover the power of this new CD-ROM product. Call

The Most Complete
Database of Computer
Product Information
Available

now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$395.*

LIBRARY™

One Park Avenue,
New York, NY, 10005

CALL NOW FOR A FREE
DEMONSTRATION DISK
212-503-4400

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.
*U.S. and Canada only. Outside U.S. \$1195

MULTI USER BBS



Now Shipping Version 6.0!

It's the perfect way to coordinate communications between hundreds of people, around your office, or around the world. For more information, call...

Sales & Literature Hotline

1-800-328-1128

Outside U.S. and Canada
Voice: (305) 583-5990
Fax: (305) 583-7846

GALACTICOMM

CIRCLE 1020 ON READER SERVICE CARD

COLOR
3⁹⁵
& UP
SLIDES

COLOR PRINTS

35mm SLIDES

OVERHEADS

SCANNING

800-433-8829

IMAGE CENTER

CIRCLE 1023 ON READER SERVICE CARD

Special Online Offer!

DELPHI is the place to be if you're looking for online fun and value. Through this special trial offer you get 5 free hours to see for yourself!

**5 Hours
FREE!**

Here's How:

- Over 20,000 downloadable files
- Real-time connection to the Internet
- UPI and Reuters newswires
- E-mail, Fax, and Telex
- Multi-player games
- Low-cost membership plans
- Active chat services

Dial by modem,
1-800-365-4636

At Password type,
PCM2

Questions? Call 1-800-685-4005

CIRCLE 1025 ON READER SERVICE CARD

**Walnut Creek
CDROM**

1547 Palos Verdes
Suite 280
Walnut Creek, CA 94596

+1-510-947-5996
FAX +1-510-947-1644

+1-800-786-9907

CDROMS \$24.95

Simultaneous Media CDROM \$24.95
Over 100 megabytes of 800+ files. Programming tools. DOS utilities. Text, data, audio. BBS publishing. Nam radio. Education much more. BBS support. December 1992.

CICA MS Windows CDROM \$24.95
Hundreds of Microsoft Windows programs. Games. Utilities. Source code. programming tools. BBS support. November 1992.

Hobbes OS 2 CDROM \$24.95
Thousands of OS 2 programs. including games. utilities. drivers. December 1992.

Source Code CDROM \$39.95
600 megabytes of source code for games. utilities. etc. Mostly C. Lots of Pascal. C++. Fortran. Lisp. Modula. Assembly. etc.

The C Users' Group Library CDROM \$49.95
The entire library of C and C++ source code. volumes 1-100. 354.

Libris Britannica CDROM \$69.95
Over 600 megabytes of the best British Shareware from PDSI. Includes a 124 page manual. November 1992.

CDROM Caddies \$ 4.95

CIRCLE 1023 ON READER SERVICE CARD

It's 8:30 am, do you know where your classes are?

With Logical CLASSmate™ software, we can help you find out.

As a training manager, we know it's a challenge to:

- keep on top of scheduled course offerings and the people registered for them
- avoid double-booking classrooms or instructors
- compile and organize data for billing
- communicate important information to trainers, facility managers, sales reps, and others.

Logical CLASSmate software supports four major functions: Registration, Scheduling, Reporting, and System Administration -- all designed to help you meet these challenges and many more!

Logical CLASSmate software is available in both single-user, \$995, and network versions, \$3,995.

To receive a **FREE** demo diskette, call **1-800-456-4677, ext. 41**

You'll be amazed at how organized you can be.

CIRCLE 1026 ON READER SERVICE CARD

Actual computer scanned images.

SuperVGA Computer Images

Also VGA/EGA/CGA/Mono and Animation

1024x768x256

Photographic Quality Real Color Images

BBS 1-800-GO-MODEM Toll-Free Lines

Exclusive from Event Horizons. 50,000 top quality, state of the art color MaxiPic GIF images and Sound VGA Movies, all categories, ratings, resolutions.

BBS 800-GO-MODEM, or BBS 503 697-5100. \$12/hr. Toll-Free lines \$6/hr extra

No Modem? Order our Mail Image Library with Samples for \$9. World-wide shipment. Info voice line 503-697-7700. Credit cards accepted. Same day shipment anywhere.

Event Horizons
311 Ave B, Suite 208
Lake Oswego, OR 97034
Information: 503-697-7700

CIRCLE 1024 ON READER SERVICE CARD

We DOS Windows®!

TRANSOM™ instantly upgrades all your DOS applications to Windows.

This new software product from Metro lets you:

- Use scalable TrueType fonts in your non-Windows DOS applications.
- Preview DOS output before printing.
- Use Windows' Clipboard to import any DOS text and graphics.
- Print your DOS documents at near HP LaserJet III quality on your dot matrix, ink jet, or earlier generation laser printer.

Special Introductory Offer! Only \$99.95

List price \$129.95. Be sure to mention this ad when you call

1-800-697-6971

Metro Software, Inc.
4650 N. Highway Dr., Dept. PC1
Tucson, Arizona 85705

CIRCLE 1026 ON READER SERVICE CARD

IBM • TATUNG • PANASONIC • SANYO • SHARP • NORTHGATE • HYUNDAI • AST • SAMSUNG • KAYPRO • DTK • EVEREX • COMPAQ • NEC • WYSE

ROM BIOS UPGRADES

Solve Your Compatibility Problems!

8 Years of experience, unmatched in the industry
WE STOCK THE LARGEST VARIETY OF ROM BIOS UPGRADES IN THE WORLD.

FEATURES OF A NEW BIOS

- Memory Upgrades
- Motherboards
- BIOS Reference Manuals
- Diagnostic Products

SmartMicro TECHNOLOGIES, INC.
 ORDER (800) 266-1576
 FAX (805) 371-0012 TEL (805) 371-0052

• FREE Catalog • FREE Chip puller • FREE Tech support • Volume Discounts
 • Univ. S Corp. POS Welcome • Same Day Shipping • DEALERS WELCOME • Call for special pricing, free bios resellers kit • Authorized Microtechnics BIOS Distributor

WE WILL BEAT ANY ROM BIOS COMPETITORS PRICE!
 143 TRIUNFO CANYON RD, SUITE 103 • WESTLAKE VILLAGE, CA 91361

GATEWAY • EPSON • TANDY • DELL • NCR • EVEREX • COMPAQ • NEC • WYSE

CIRCLE 1028 ON READER SERVICE CARD

ROM BIOS UPGRADES

For Your IBM or Compatible-A New BIOS Upgrade Will

- Support Windows 3.0/3.1 • Support 360K, 720K, 1.2MB & 144MB Floppy Drives
- User defined hard drive types • Support VGA • Novell & Netware compatible
- Expanded hard drive table • Enhanced 101/102 keyboard • 100% IBM compatible
- Complete documentations • DOS 5.0 • Latest Version • Complete set up in ROM
- PS/2 Mod 30

FREE INTEL CHIP PULLER

ROM BIOS UPGRADES AVAILABLE FOR:

• IBM	• Sperry	• Hyundai	• Wyse
• Acer	• Northgate	• Sanyo	• Kaypro
• Leading Edge	• Tandy	• Samsung	• Compaq
• DTK	• AST	• Wells American	• Everex
• Dell	• AMI	• Epson	• And Many More

ORDER TODAY **1-800-800-2467**

UNICORE SOFTWARE
 1030 Tumpkin St. • North Andover, MA 01860
 (508) 686-6468 • FAX (508) 683-1630

CIRCLE 1029 ON READER SERVICE CARD

SoftSpoken Mailer

File Edit Search Group Print Manage Window Help

Record # 2083 of 2084 (9 deleted)

C:\SM\DATA\MAILLIST.SM

First Last

Bruce

Company

SoftSpoken Inc.

Addressing 1

PO Box 18343

Addressing 2

Slash Postage Costs Up To 60% or More!

SoftSpoken Mailer™ Mailing List Manager for Windows

- Top USPS ZIP-4, carrier route & forwarding address database
- Print USPS-certified barcoded labels • Present bulk mail
- Mail merge WordPerfect & Word for Windows
- Eliminate duplicates • Free brochure.

(919) 870-5694
 SoftSpoken Inc.
 PO Box 18343
 Raleigh, NC 27619

CIRCLE 1030 ON READER SERVICE CARD

ANNOUNCING

Computer Select™

The Most Complete Database of Computer Product Information Available

With **COMPUTER SELECT** you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms

Discover the power of this new CD-ROM product. Call now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$995.*

LIBRARY

One Park Avenue,
 New York, NY, 10017

CALL NOW FOR A FREE DEMONSTRATION DISK
212-503-4400

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.
 *U.S. and Canada only. Outside U.S. \$1195

When your presentation is in ten minutes, but the latest data is three thousand miles away...

ReachOut for the solution!

Whether from a laptop computer in your hotel room or from a PC at home, take control and find yourself working as comfortably and productively as you would sitting in front of your office computer.

Transfer files with record-breaking speed. Review and update spreadsheets or edit reports faster than you ever thought possible.

See for yourself why so many companies have chosen ReachOut as their Remote Control standard.

For a free demo call: 1-800-677-OCEAN

Ocean Isle
 49 Royal Palm Blvd., Vero Beach, FL 32960
 Phone: 407-770-4777 • Fax: 407-770-4779

REACHOUT REMOTE CONTROL

WITH DOS AND WINDOWS SUPPORT ALL IN ONE PACKAGE

CIRCLE 1031 ON READER SERVICE CARD

Sensational Sound... for a song!

Multimedia applications spring to life with music. Finally, an easy and powerful way to create your own sound!

Midisoft Studio for Windows is the first and only PC music software to display standard musical notation instantly during recording, editing and playback. A wide array of entry and editing features let you compose and perfect original music. Running out of time? Just polish pre-recorded MIDI songs to add style and punch to your presentations.

For making music in the boardroom, the classroom or the livingroom, you won't find a more affordable, flexible recording studio anywhere!

What's more, you don't have to be Beethoven to use it.

Midisoft Studio for Windows, \$249.95.

800-PRO-MIDI

MIDISOFT

CIRCLE 1032 ON READER SERVICE CARD



"Your PC Magazine Memory Source for over 4 years!"



MEMORY PRODUCTS & UPGRADES

DRAMS

	100NS	80NS	70NS
1MB X 1:	\$4.25	\$4.50	
256K X 4:	4.35	4.50	
256K X 1:	\$1.49	1.50	1.75
64K X 4:	1.50		

IBM TYPE SIMMS/SIPPS

	9-CHIP:	80NS	70NS	60NS
4MEG X 9:	\$132	\$139	\$149	
1MEG X 9:	37	40	45	

72-PIN SIMMS

1MB X 36-80NS (4MB)	\$169
1MB X 36-70NS (4MB)	\$175

MATH COPROCESSORS

	INTEL	CYRIX
80387/SX	\$89	\$79
80387/DX-33	\$95	\$89
80487/SX	\$ LOWEST	

PS/2 UPGRADES

30/286	
2 MB KIT	\$95
35SX; 40SX; 50Z; 55SX; 65SX; 70's	
2 MB	\$95
35SX; 40SX; 55SX; 65SX/L8	
4 MB	\$169
35SX/L8; 40SX; 55SX; 90; 95	
8 MB	\$319
EXP BRD: 50; 50Z; 60; 55SX; 65SX	
2-8 MB w/2 MB	\$235
EXP BRD: All Models 70 & 80	
2-14 MB w/2 MB	\$275
4-16 MB w/4 MB	\$349
PS/2 140SX/N33SX LAPTOPS	
2/4/8 MB	\$99/175/349
PS/2 N51SX	
2/4/8MB	\$ LOWEST
PS/1 UPGRADES	
2/4MB	\$ LOWEST

LAPTOP UPGRADES

COMPAQ	
CONTURA 386SX 20/25	
2/4/8 MB	\$ LOWEST
LTE 386S/20	
4 MB	\$109
SLT 386S/20	
2/4 MB	\$125/170

TOSHIBA

1200XE; 1600; 3100E	
2 MB	\$95
3100SX; 3200SX/SXC	
2/4 MB	\$95/179
4400SX; 6400	
2/4/8 MB	\$145/209/405
AST EXECUTIVE	\$ LOWEST
DELL	\$ LOWEST
TI TRAVELMATES	\$ LOWEST

DESKTOP UPGRADES

COMPAQ DESKPRO	
286E; 386-20/20E; 25/25E	
4 MB	\$189
386S/16	
4 MB	\$189
386-20E/25E; 386S/16	
4-12 MB EXP BRD	\$229
286N; 386N; 386SX/20; 486M's	
2/4 MB	\$95/175
386/33L; 486-25/33L; SYS PRO	
2/8 MB	\$105/349
PROLINEA	\$ LOWEST
AST PREMIUM	\$ LOWEST
DELL	\$ LOWEST
GATEWAY 2000	\$ LOWEST
MAGNAVOX	\$ LOWEST
PACKARD-BELL	\$ LOWEST
NEC POWERMATE	\$ LOWEST

LASER PRINTER UPGRADES

HP II; HP; HP; HP; HP; HP+	
2/4 MB	\$90/165
HP IIIa	
1/4 MB	\$49/150
HP IV	\$ LOWEST
PANASONIC 4420; 4450I	
2/4 MB	\$119/169
PANASONIC 4410/4430	
2/4 MB	\$129/199
IBM 4019; 4019a	
1/2/3.5 MB	\$75/110/149
IBM 4029	\$ LOWEST
EPSON EPL6000; TOSH PGLASER	
2/4 MB	\$119/189
EPSON ACTHLR II	\$ LOWEST
OKI 400	
1/2 MB	\$70/105
CANON LBP; BROTHER; KYOCERA;	
NEC SW; TI MICLSP	\$ LOWEST

TERMS & CONDITIONS

- 30-DAY RISK-FREE GUARANTEE
- ALL PRODUCTS FIVE-YEAR WARRANTY.
- Price & availability subject to change.
- 15% restocking fee on non-defective returns & refused orders.
- Shipping charges are non-refundable.

No Surcharge on VISA/MC
PD's Accepted from Gov't and Qualified Firms
30-Day Money-Back Guarantee

INFINITY
Memory Products & Upgrades
633 Post Street, Box #197
San Francisco, CA 94109-8215

MEMORY HOTLINE
1(800) 444-7785
(415) 390-2967 Fax: (415) 390-5402

CIRCLE 601 ON READER SERVICE CARD



LOW WAREHOUSE PRICES

1MB SIMM	80ns	\$30
4MB SIMM	80ns	\$117

TYPE	PKG	80ns	60ns
256K x 1	DIP	\$.99	\$1.38
256 x 4	DIP	\$3.77	\$4.19
1M x 1	DIP	\$3.52	\$3.62
256K x 9	SIMM	\$8.88	\$12.47
1M x 9	SIMM	\$30.00	\$32.00
4M x 9	SIMM	\$117.00	\$127.00

MATH CO-PROCESSORS

80287-XL	INTEL	\$82.35
80387-SX 16-25	INTEL	\$78.47
80387-DX 10-33	INTEL	\$82.35
80487-SX	INTEL	\$389.00
8387-25	CYRIX	\$85.29
83087-40	CYRIX	\$115.00
2C87-12	INT	\$48.41
2C8-20	INT	\$58.82

408-559-0603
FAX 408-559-0301
2050 Camden Ave., #330 San Jose, CA 95124

All Merchandise 100% guaranteed. We accept VISA, MC, Discover, and company PO's with prior approval. Price, delivery and manufacturer subject to change. Minimum order \$100.00. Returns require RMA; non-defective returns subject to a 15% restocking fee.

CIRCLE 605 ON READER SERVICE CARD

Laptop Memory

PCMCIA 2.0 SRAM Cards.			
RJB-0512	512Kb	\$ 99	
RJB-1000	1Mte	\$119	
RJB-2000	2Mte	\$249	

Powerbook:
100 140 145/160 170 180

Toshiba:
1000XE SELE 1800 1850 2000
2000SX SXE 3300S 4400SX

Printer Sharing



Local Connection
800-238-9415
FAX: 503-350-6372

CIRCLE 602 ON READER SERVICE CARD



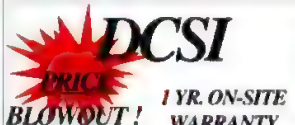
REMOTE ACCESS

Office & Home Computers
Network/Servers • Remote Booting

- Call-in & activate computer On or Off with touch-tone control.
- 1-10 Selectable rings with answer machine compatibility.
- Increase security. Save energy. Extend hardware/disk life.
- Compatible w/all communications & remote control software.
- Additional Multi-Unit Remote Control options available.
- UL listed - FCC Registered - Fully Guaranteed.

\$129.95+ \$4.00 S/H
Vant Systems Inc. 5210 Lewis Rd Bldg. 8,
Agoura Hills, CA 91301
1-800-266-1733 Ext. 140
Tel 818-706-1733 Fax: 818-789-2643

CIRCLE 603 ON READER SERVICE CARD



386 DX 40	1499.00	OR LESS!
486 SX 25	1550.00	
486 DX 33	1795.00	

FOR BLACK ADD \$ 250.00
LOCAL BUS AND EISA TOO

4 Mb 70 Ns RAM / 105 Mb HARD DISK
1.2 & 1.44 TEAC FDD
1024x768 SVGA W/ 1 Mb
1024x768 14" VGA 28 MONITOR
IDE / FDD 2 S/ 1P/ 1 GAME
101 KEY ENHANCED KEYBOARD
DESKTOP AND MINI-TOWER CASES
DOS 5.0 / WINDOWS 3.1 W/ MOUSE

TOLL FREE TECH-SUPPORT
AND 24hr. BBS
1 (800) 676-DCSI
WE ACCEPT REQUESTS FOR BID
ALSO COMPLETE MONITOR REPAIR

CIRCLE 604 ON READER SERVICE CARD

Up to 43% off!

IBM PS/2's

	IBM Retail	Your Cost
MODEL 30 286/E01	0MB	1,625 395
MODEL 35 040	0MB	1,310 875
MODEL 55 081sx	80MB	2,000 1,150
MODEL 57 045	80MB	1,950 1,395
MODEL 70 081	80MB	2,075 1,475
MODEL 70-A81	80MB	2,275 1,650
MODEL 80 081	80MB	3,825 2,550
MODEL 80-A31	320MB	5,825 3,475
MODEL 90 0K9	160MB	3,730 3,225
MODEL 95 0KD	320MB	4,958 4,250
MODEL 95 0KF	400MB	5,250 4,500
8512/8513		325/2300

We also carry the FULL IBM COMPAQ and HP Lines
Call For Latest Pricing

AMERICAN MICRO COMPUTER CENTER
6073 NW 167th Street • Unit C-27
Miami, FL 33015
PH: (305) 825-5565 FAX: (305) 825-7774

CIRCLE 605 ON READER SERVICE CARD

486-66 MHz EISA

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. NOW, for our 7th year anniversary special, we are proud to introduce our fastest and most powerful machine, the 80486-66MHz or 33MHz.

MICROCACHE 386-33MHZ

\$795

- 80386-33MHz
- 385-33MHz CACHE Controller
- 4MB RAM, expands to 32MB
- 125MB Fast Drive (15ms)
- 1.2MB Floppy Drive
- 2 Serial/Parallel
- Enhanced Keyboard
- 64K Cache
- 40MHz Add \$20

MICROCACHE 486-33MHZ

\$1295

- 80486-33CPU, 4MB RAM
- 210MB Hard Drive (15ms)
- Enhanced Keyboard
- 66 MHz DX2 add \$400
- 1.2MB Floppy Drive
- 64K Cache
- 50 MHz DX2 add \$200

MICROCACHE 486 EISA-33MHZ

\$1895

- Intel 80486 33CPU, 4MB RAM
- 340MB Hard Disk Drive (13ms)
- Enhanced Keyboard
- 66 MHz DX2 add \$400
- 1.2MB Floppy Drive
- 128K Cache, expandable to 256K
- 50 MHz DX2 add \$200

MOTHERBOARD SPECIAL

- | | | | |
|----------------------|--------|----------------------|--------|
| ■ 386SX-25MHz | | ■ 386-33MHz | |
| W/2MB RAM | \$249 | W/64K Cache/4MB RAM | \$349 |
| ■ 486-33MHz | | ■ 486-50MHz DX2 | |
| W/64K Cache/4MB RAM | \$649 | W/64K Cache/4MB RAM | \$849 |
| ■ 486-66MHz DX2 | | ■ 486 EISA-33MHz | |
| W/64K Cache/4MB RAM | \$1049 | W/128K Cache/4MB RAM | \$949 |
| ■ 486 EISA-50MHz DX2 | | ■ 486 EISA-66MHz DX2 | |
| W/128K Cache/4MB RAM | \$1149 | W/128K Cache/4MB RAM | \$1349 |

EXPANSION OPTIONS

- | | | | |
|-------------------------------|--------|-----------------------------|-------|
| ■ Nanao F550i Monitor 17" | \$1099 | ■ ATI Graphics Ultra | \$429 |
| ■ Sony 1304 HG Monitor 14" | \$579 | ■ Novell NE 1000 Kit | \$129 |
| ■ SVGA (1024x768) Monitor 14" | \$299 | ■ TVGA Card (1024x768) 1 MB | \$99 |
| ■ Orchid Pro Designer II 1MB | \$199 | ■ NEC/Seiko/Hitachi | |
| ■ PDI Caching Disk Controller | | 20 Monitor | \$585 |
| (0.3ms) W/512K RAM | \$299 | | |

MS ENGINEERING, INC.

10601 S. De Anza Blvd., Suite 214
Cupertino, CA 95014

(408) 257-4249 FAX: (408) 257-4398

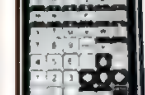
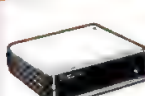
SALES HOURS: Monday-Friday 9:00 AM-5:30 PM, Saturday 10:00 AM-3:00 PM PST
486,386 and SX are trademarks of Intel Corp.

CIRCLE 607 ON READER SERVICE CARD

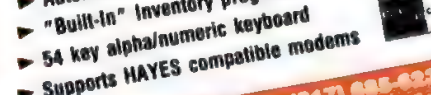
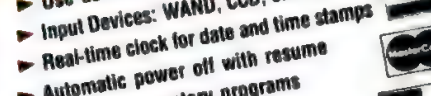
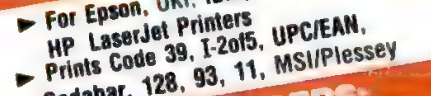
BAR CODE READERS

AMERICAN MICROSYSTEMS
2190 Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS:



- ▶ No software changes required
- ▶ Data appears as keyboard input
- ▶ Reads Code 39, I-2of5, UPC/EAN, Codabar 11, 93, 128, MSI/Plessey
- ▶ Auto-discriminates between codes
- ▶ Accepts WAND, SLOT, MAG STRIPE, CCD, LASER
- ▶ Easy To Use



BAR CODE PRINTING SOFTWARE:

- ▶ For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers
- ▶ Prints Code 39, I-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey

PORTABLE READERS:

- ▶ Use as a portable, wedge or terminal
- ▶ Input Devices: WAND, CCD, or 5V LASER
- ▶ Real-time clock for date and time stamps
- ▶ Automatic power off with resume
- ▶ "Built-in" Inventory programs
- ▶ 54 key alpha/numeric keyboard
- ▶ Supports HAYES compatible modems

(800) 648-4452 • FAX: (817) 571-9022
30 Day Money Back Guarantee
One Year Warranty

Computer Power Unlimited

SYSTEMS • UPGRADES
• PERIPHERALS •

386DX40* \$1299

4MB, SVGA, 130MB, 1.2, 1.44,
101 Key, 251IP, Windows 3.1, DOS

* 486SX/25 MHz Add \$99

Additional Items On Special...

- 1MB Simm 70ms \$30
- TEAC 1.2 or 1.44 Floppy Drive \$57
- 386SX/25 MHz with CPU & 1MB \$189
- 386DX40 MHz with CPU & 1MB \$239
- 486DX50 MHz with CPU & 256K Cache \$799
- 130MB Master Hard Drive \$299
- 14" SVGA 28 Monitor \$289

(800) 576-4CPU

Phone (818) 879-8099 Fax (818) 879-8095
31139 Via Colinas Suite 206
Westlake Village, CA 91362

CIRCLE 600 ON READER SERVICE CARD

ESCCOMPUTERS INC.

Mother Boards / Systems:

Mini-Tower Case, 220W PS, 4MB RAM, 1.2MB & 1.44MB FD / HD Controller, 25, 1P, 1G Ports, 130MB DE Drive, SVGA Card w/1MB and 14" SVGA Monitor, 2 No Mouse, Windows 3.1

• 286/25MHz	\$69
• 386SX 33MHz	\$129 / \$1 199
• 386DX 33MHz/64K	\$149 / \$1 299
• 486DX 33MHz/64K	\$199 / \$1 499
• 486DX 33MHz/64K	\$199 / \$1 299
• 486DX 50MHz/256K	\$249 / \$1 999
• 486DX 66MHz/256K	\$299 / \$1 999
• 486DX 66MHz/256K	\$299 / \$1 999

Add On Card:

- Super-IDE 2 HD / 2.5 L.P. I.G. \$10
- 1.2/1.44MB Controller w/512K \$15
- Accessory: 250K w/256K \$15
- Trained 8088/8086 w/1MB \$29
- 2400/9600 BPS Modem \$65
- 9600 BPS Internal Modem \$199

Hard Drives:

- 1.2MB 84MB 16ms \$299
- 1.2MB 120MB 16ms \$299
- 1.2MB 212MB 12ms \$499
- 1.2MB 510MB 12ms \$599

Monitors:

- 14" Mono B&W Flat Screen \$99
- 14" SVGA D 28 Dot Pitch \$279
- 14" SVGA D 28 Dot Pitch N 1 \$319

In business for 7 years

1-800-747-4ESC

7042 Owensmouth Ave. Canoga Park, CA 91303
Tel: (818) 888-0188 Fax: (818) 888-7090

CIRCLE 609 ON READER SERVICE CARD

It's A Jungle Out There!

But PC Magazine Classified Delivers
The Lion's Share of the Market.

PC Magazine makes seller easier by delivering
responsive direct buyers twice monthly.

PC Magazine adds trigger immediate response
and direct ads.

Call your PC Magazine Marketplace
account representative today at:

1-800-825-4237



Source: PC Magazine Direct Market Subscriber Study, 1992 (past 12 months)

WORTHINGTON

BAR CODE HEADQUARTERS

DATA SOLUTIONS OFFICES IN USA AND EUROPE

QUALITY • SERVICE • 800 SUPPORT

LABELS

BIG TEXT
UPC MSI 2015 126 Code 39

LOGOS/Symbols

LABELING SOFTWARE

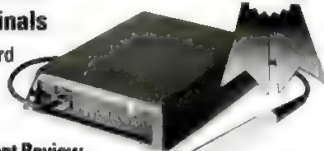
- For Epson, Oki, IBM, and LaserJet.
- Flexible design. Any Format or size.
- On-Screen Label Design, WYSIWYG.
- 16 text sizes — 3" reads at 100'
- Bar codes: 2of5, 128, UPC/EAN, AIAG, MIL-STD, ZIP+4, and Code 39

- Auto-incrementing. File input. Logos, symbols — from your scanner.
- Reversals, color, soft fonts. Powerful, Versatile, Fast, Easy!
- Rotatable, shadable, scalable fonts from 0.1" to 13" on LaserJet III
- Above label printed with LabelRIGHT™ — \$279
- Sato, Zebra & Prodigy version — LabelRIGHT Thermal — \$479
- Other menu driven programs from \$129. SCD/UNIX — \$199

BAR CODE READERS

for PC, XT, AT, PS/2, Mac
and all RS-232 Terminals

- Attaches as 2nd keyboard
- No software changes
- 2of5, UPC/EAN, 128, Codabar, MSI, Code 39
- Top Rated by Independent Review
- Magstripe, laser, CCD, or wand input
- 1 or 2 input devices per reader
- 100 configurable options. Superior read rate.
- Complete with PSC or Symbol laser gun — \$1389
- Complete with steel wand — \$399

FCC Class B and
VDE Class B
Approved

PORTABLE READERS

- Battery operated. Simple, Flexible, Powerful!
- 64K — 256K memory. Bar code or key input
- Big Rubber Keys. Date/Time Stamping
- Operates as Portable, Wedge, or Terminal
- Built-in Generator for Easy Programming
- 2 Built-in Inventory Programs or 3 User Written
- Upload Programs Furnished or use Xmodem
- 3 Data Files — 3 Tables for Verification
- Wand, CCD or Laser input
- Complete 64K units with wand — \$799



Same Day Shipping! • Made in the USA • 2 Year Warranty on Wand and Decoder

European Office:

Rüthstrasse 6
9050 Appenzell, Switzerland
71 87 51 15 • 71 87 51 17 Fax

USA Headquarters:

3004 Mission Street
Santa Cruz, CA 95060
408-458-9938 • 408-458-9964 fax

In Europe, Call Information for Toll-Free Number to Swiss Office

Worthington Data USA or Canada

800-345-4220

30 Day Money Back Guarantee!

ITS BAR CODE READERS

More Features, More Affordable

NEW IMPROVED



Starting at \$279 with wand! ■ Transparent operation ■ No software required ■ PC, XT, AT, Mac, PS2, others. Look into our full line of reliable, competitively priced readers, keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software ■ OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

East Coast 800-826-1688
West Coast 800-228-9487INTERNATIONAL
TECHNOLOGIES
& SYSTEMS CORP.

ITS

9201 Forest Hill Ave., Suite 108,
Richmond, VA 23235
(804) 272-0138, Fax (804) 272-0357
655-K North Berry St., Brea, CA 92621
(714) 990-1880, Fax (714) 990-2503

CIRCLE 610 ON READER SERVICE CARD

Laser Printers
Specialists!

We Know What We Sell!

Over 20,000 Satisfied Customers
Largest Inventory of Printer Enhancements

PrinterFax - by Moonlight

Stores several pages
Date and time stamp
Installs in minutesBest Fax
Yet!!!Receive sharp
clear, plain paper
Faxes on your HP LaserJet
Plugs right into the font cartridge slot

Full PostScript™

compatibility
Up to 1200 dpi
50 premium
typefaces. High-
performance/fast
Windows printingWinJet 800 for LJ2/LJ3 \$695
WinPrinter 800 stand alone CALL
WinJet 1200 for LJ4 \$885Plugs into LJ2/3(256K-4MB buffer, 115 kbaud)
ST400 4 Serial \$265
ST500 4 Serial/1 Parallel \$309
ST600 6 Serial \$389
ST700 6 Serial/1 Parallel \$479
ST1200 12 Serial \$719External Sharing for any printer
JW421 4 Serial \$269
JW821 8 Serial \$429Install any printer directly on your LAN
JL100/JLP100 \$469
JL200/JLP200 \$469Available for most Laser Printers!
Every board pre-tested
with lifetime
warranty
Over 50 laser
printers supported

- Full line of PostScript, Font, and Custom cartridges available
- Large Capacity Feeders, Paper Trays
- Plain Paper Fax for Laser Printers, Fax Switches

Adobe PostScript
Cartridge for HP
LaserJet Series II, Get
free Type 1 or 2
Cartridge and ATM (Total
of up to 53 typefaces)\$228 Extra Bonus: 2MB Memory
for only \$99Adobe Systems, Inc. Engineering,
JetFax, Pacific Data, LaserPlex,
Command Communications
30 Days Money Back - We ship the same day
Lowest Price Guaranteed!!!800-747-HPLJ
1-800-474-4756DH Systems, Inc.
1940 Corner Ave.
Los Angeles, CA 90025
TEL: (310) 479-4477
FAX: (310) 478-4770 systems

CIRCLE 611 ON READER SERVICE CARD

SAVE ON
9 TRACK TAPE SYSTEM
FOR IBM PC/XT/AT
286/386/486



- Mainframe to PC Data Transfer
- High Speed Backup, Data Compression
- Data Extraction, Database Compatible
- Ready to Operate Systems
- Service and Support, Easy Installation
- 3480 & Cartridge Tape Systems

call (919) 763-8400 or write to:
WILTEC Inc.
PO Box 7368 Wilmington, NC 28406

WILTEC

11.2 MB FDD
17.2 MB FDD
1.2 MB FDD
1.2 MB FDD

At TAC we are the full line to all users of network storage proprietary interface and cable included. Specify PC or MAC with order. Lowest price guaranteed.

TAC
PO BOX 650
Meridianville, AL 35759

(205) 628-6021
FAX (205) 618-0077

CIRCLE 612 ON READER SERVICE CARD

GREAT SOFTWARE UNBEATABLE PRICES!

dBase IV v1.5\$359
LAN PAK (10 ct).....\$1500
LAN PAK (1 ct).....\$165

dBase III+ v1.1.....\$279
LAN PAK (5 ct).....\$490

Paradox\$359
(v9.5 and 4.0 LAN PAKS Available)

Lotus 123 v3.1 servers.....\$430
123 v3.1+ node\$235
123 v2.3 & 2.4 server.....\$385
123 v2.3 & 2.4 node.....\$215
Symphony v2.2 server\$430
Symphony v2.2 node\$235
Freelance Graphics
v4.0 server\$385
Freelance Graphics
v4.0 node\$215
123 for Windows server\$430
123 for Windows node\$235

Many other Borland/Ashton-Tate and Lotus products available.

Discounts given to volume buyers.

Prices good while inventory lasts! All products carry manufacturer original warranty.

Call for your special pricing today!

S. & E. Software

448 IGNACIO BLVD., SUITE 265, NOVATO, CA 94949-USA
800-825-1510

CIRCLE 614 ON READER SERVICE CARD

THE DATA ENTRY EMULATOR

Full featured, heads-down data entry, with...

- Two-pass verification
- Paint the screen formatting
- Supervisor & batch control
- Easy output reformatting
- Operator statistics
- Powerful editing capability
- Customizable menus
- Tutorial exercises
- Context-sensitive help
- Free technical support

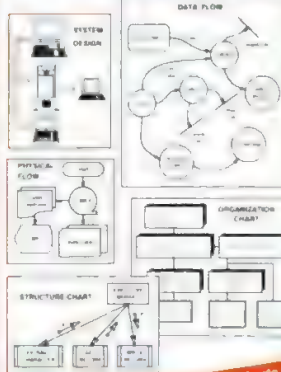
PC from \$395 Also for LAN s.
IBM AS/400 IBM S/36

FREE AND

COMPUTER KEYES
21929 Mahak Rd
Woodway, WA 98020

USA: 800/356-0203
Tel: 206/776-6443
Fax: 206/776-7210

RFFlow
Professional flowcharting
For Microsoft® Windows



Create professional, fine quality charts quickly and easily. Call for demo disk. (503) 853-5767 FAX (503) 853-4966

\$129.00 **RFF ELECTRONICS**

CIRCLE 615 ON READER SERVICE CARD

The Mail Order Wizard

A complete order-processing system for any size mail-order company. Includes list management, charge-card approvals, UPS manifest, and reports galore!

Systems from \$495 to \$6995

Call for free information or \$20 demo. See why **Home-Office Computing** awarded the Wizard ☆☆☆☆

The Haven Corporation
802 Madison St., Dept. M93
Evanston, IL 60202-2207
800-860-0098
(outside the U.S. 708-869-3553)

CIRCLE 616 ON READER SERVICE CARD

MAIL ORDER MANAGER™

America's most popular, most complete, and most affordable solution for the mail order business—order entry/review, credit card processing with draft capture, UPS manifesting, profit analysis, accounting, telemarketing, list management. Clipper compiled, dBase III + files. Single and Multi-user versions. Find out why more people buy MOM after comparing! Call for demo kit.

Dydacomp Development Corporation
150 River Road, Suite N1, Dept PCM
Montville, NJ 07045
1-800-858-DMOM
201-335-1258

CIRCLE 617 ON READER SERVICE CARD

PC DATA ENTRY FOR ALL APPLICATIONS

- End-user data entry
- Replaces key-to-disk systems
- Menu-driven edit selection
- Easy form design
- LAN or Stand-Alone
- Toll-free support hotline

DATALEX
800-962-8888
415-362-4466 • FAX 415-362-5733
from Canada 800-848-5548

ENTRYPOINT

CIRCLE 613 ON READER SERVICE CARD

BAR CODE PRINTING

BEAR ROCK MEANS BAR CODES



1 (800) 232-7625

- Bear Rock Labeler™ Windows labeling program with eleven bar code symbologies.
- PrintBar™ Bar code font packages for the Macintosh.
- PrintBar II™ Dos memory-resident bar code package for PCs.
- PrintBar SoftFonts™ Soft font package for LaserJet printers.
- PLUS: Source code, readers, scanners, and much more!

For more information call:
1-800-232-7625

Bear Rock

4140 Mosier Lodi Drive • Shingle Springs, CA 95682
(916) 672-0244 • FAX (916) 622-4775

THE DATA ENTRY SOFTWARE SYSTEM FOR PCs

KeyEntryIII®
Announcing Version 6.0!!

- Completely revised and redesigned documentation
- Totally new user interface
- New pull down menus, windows, and dialog boxes
- Powerful editing capabilities
- Enhanced data formatting capability
- Upgradable to ImageKey™ for image-assisted data entry

Call 800-533-6879 for more information!

SCS SOUTHERN COMPUTER SYSTEMS, INC.
205-251-2985 • FAX 205-322-4851
In UK SCS Europe Ltd
0753 536550 • FAX 0753 536765

B.S. & M.S. In Computer Science

- ALL COURSES HOME STUDY
- Approved for tuition reimbursement by leading corporations
- Increase your earning power
- Join students from leading computer companies
- Approved Ada course available

FOR FREE INFORMATION CALL
1-800-767-AICS

AMERICAN INSTITUTE COMPUTER SCIENCES
The leading edge of learning

SlideImagers



PostScript™ Imaging

- Slides
- Overheads
- Canon Fiery Color Lasers

(800) 232-5411
(404) 874-6740

NOW AVAILABLE: Scanning Services (Rates based on system time)

Quality So Good It Should Cost More!

CIRCLE 616 ON READER SERVICE CARD

GREAT SOFTWARE

- 53 EGA/VGA GAMES
- 88 WINDOWS® PROGRAMS
- 36 EDUCATIONAL PROGRAMS



PAY ONLY \$9.95 PER COLLECTION

CREDIT CARD ONLY

INCLUDES SHIPPING & HANDLING
FOREIGN ADD \$5.00 PER COLLECTION

SMC SOFTWARE PUBLISHERS

619-931-8111 Ext 511

CIRCLE 623 ON READER SERVICE CARD

SEP-FREE™ COLOR

Short Run Printing

Quality without Flies

Slides from \$3.00
Scans • Overheads

Microsoft® Visio
24 Hour Service
Elegant Graphics

750 Princeton Ave., Box 774607
Stamford Springs, CO 80477 (303) 879-4334
• FAX (303) 879-5206
• TOLL FREE (800) 879-4334

CIRCLE 619 ON READER SERVICE CARD

CD-ROM QuickTime Movies for Windows and Mac!

from canyon

Categories include historical, modern, music videos, sound only movies and 24 Bit color photos. Includes QuickTime Windows player.

1-800-227-1817 ext 45

8am to 5pm Mon - Fri

\$89.95

MasterCard VISA

CIRCLE 621 ON READER SERVICE CARD

Key-Lok™ Security

- ☐ Fighting piracy since 1982.
- ☐ Algorithmic response
- ☐ Programmable memory
- ☐ Very economical
- ☐ Device transparent to PARALLEL/SERIAL port
- ☐ Multiple security layers
- ☐ Counters/Real-time clock
- ☐ Multiproduct licensing
- ☐ DOS/UNIX/VMS/etc

.....

Access Control System
.....
Diskette Drive Locks

Microcomputer Applications
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

CIRCLE 624 ON READER SERVICE CARD

PC Magazine's New Classified Format puts your ad in front of 1,000,000 buyers of computer products and services at new, surprisingly affordable cost-per-inch rates.



Call your account representative today at:

1-800-825-4237

Perfect Body Parts. 99¢ Each.

MediClip... the first complete medical anatomy and art library for your MAC or IBM.

- Available in high quality EPS and all major formats
- 3 volumes of 100 images for only \$99 each

1-800-998-8705

MediClip

Outside continental U.S. add \$10.00 per volume.

CIRCLE 625 ON READER SERVICE CARD

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus™**

Try out the leading membership and accounting package.

Call today for your **FREE** full-working DEMO.

F1 SOFTWARE,
208 Ridgefield Drive,
Asheville, NC 28806
(800) 486-1800

CIRCLE 622 ON READER SERVICE CARD

THE NEW PC MAGAZINE CLASSIFIED FORMAT GIVES YOU MUCH MORE FOR FAR LESS...



- New Flexible Ad Sizes
- More Color Options
- Lower Cost-per-Inch Rates

Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

and let the new Classified work for you.



PROTECT YOUR SOFTWARE TODAY

EVERLOCK 3.0 Software Solution

- ✓ OPTION BOARD SAFE
- ✓ CPU LOCK
- ✓ REMOTE REGISTRATION
- ✓ CD ROM LOCK
- ✓ WINDOWS COMPATIBLE

with over 14 new features you have asked for over the years. If Software based protection is what you need, don't settle for anything less than **EVERLOCK 3.0**.



Az-Tech Software, Inc.

LEADERS IN SOFTWARE SECURITY
201 East Franklin, Suite 11 Richmond, MO 64085
(816) 776-2700 FAX 816 776-8398

CIRCLE 625 ON READER SERVICE CARD

EVERKEY LOCKS & BUTTONS

Hardware Solution

We have combined the Versatility of Az-Tech Software and the **ONE WIRE** Hardware Compatibility of Dallas Semiconductor in the new **BUTTON** package. With It's **PRICE** advantage and added Flexibility, **EVERKEY BUTTONS** will lead us into a **dongleless** world.

As your partner in the fight against Software Pirates, Az-Tech is the only company that offers you these options in both a Software and a Hardware Solution.



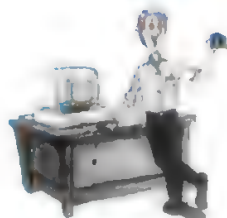
DATE & EXECUTION LIMITS COMPRESSION
ENCRYPTION SERIALIZATION* REMOTE RESET

These systems are easy to use and most importantly, they work! No other company can provide you the Compatibility, Flexibility, Ease of Use and Degree of Protection that you receive with all Az-Tech products.

Call Today For A Free Demo
1-800-227-0644

STOP SOFTWARE PIRACY

Now Networked



DEVELOPERS SAY...

"NET Hardlock's interface allows me to easily limit the number of simultaneous users without having to build this up myself. Since NET Hardlock contains an algorithmic response ASIC, I'm assured of the highest level of protection."



ACCOUNTANTS SAY...

"NET Hardlock is a welcome addition to the Hardlock family of revenue protection products. Now limiting and expanding the simultaneous user portion of the license agreement is the easy part! Our costs are lowered and the end user benefits."



END USERS SAY...

"NET Hardlock is the easiest protection system I've ever used! Once the NET Hardlock is plugged in, I don't even know it's there. Now the application can find the NET Hardlock regardless of which PC I'm using."



The only product that combines a memory option with programmable, algorithmic response—all in one compact unit.

Made in the USA

Call for your 30-Day No-Risk Evaluation Kit.

1-800-562-2543

GLENCO ENGINEERING INC.

SERVING THE SOFTWARE INDUSTRY SINCE 1979

270 Lexington Drive
Buffalo Grove, Illinois 60089-6930
708/808-0300 Fax 708/808-0313

For a distributor in Europe contact Fast Electronic GmbH, Tel: 49-89-539-800-20 Fax: 49-89-539-800-40

Other products in the Hardlock Family:
Hardlock & Hardlock with Memory (Single User)
Hardlock DES (Data Security)
Hardlock SE (Workstations)

CIRCLE 626 ON READER SERVICE CARD

HARDWARE LOCKS GIVING YOU TROUBLE?

The Intelligent Printer Port will provide absolute insurance against down time due to lock device problems. The hardware solution provides a much more reliable source of protection. Emulates the lock device 100% electronically, no resident software or device drivers required. 1 year warranty, 30 day money back guarantee.

PRODUCTS START AS LOW AS \$250.00

For more information call

SafeSoft Systems Inc.
202-1100 CONCORDIA AVE.
WINNIPEG, MB
CANADA R2K 4B8

PH (204) 669-4639
FAX (204) 668-3566

CIRCLE 627 ON READER SERVICE CARD

PC Magazine's Best
Hardware Product of the Year
and the Best of 1994
Award for Innovative Security
and Security of Data
completely affordable
easy to use



Call your account representative today at:

1-800-825-4237

SeXxy Software

SeXxy DISKS

SeXXcapades ... The GAME The First Adult Game with TRUE SOUND and 256 Color VGA Graphics

The game everyone has been waiting for. For that evening you won't forget with a loved one or group of very close friends. Fulfill your sexual desires. Find out how your partner would really like to make love. Over 80 Color VGA Scenes - Real Voices Guide the Action - Foreplay Option - Play with 2-8 Close Friends.

\$79 - Special Offer \$69 with purchase of any CD disk / VGA and hard disk required - shipped on high density disks

CONNOISSEUR COLLECTION ALL NEW! In 256 Color VGA!!

SeXxy Disk #CC1 - ★ YOU BE THE STAR ★ The FIRST CUSTOMIZABLE movie allows you to write the dialog and the title. ONLY AVAILABLE FROM US!

SeXxy Disk #CC2 - THE FIRST SOUND MOVIE! The first computer movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. OURS EXCLUSIVELY!

SeXxy Disk #CC3 - THE BEST MOVIE! The best computer movie available. Only for the serious collector. 256 stunning VGA colors.

SeXxy Disk #CC4 - VOLUPTUOUS MOVIE with Sound! See and hear a symphony of exceptionally proportioned women.

SeXxy Disk #CC5 - ODDITIES MOVIE with Sound! See men of incredible proportions and women with unique abilities - UNBELIEVABLE!

Prices: 1 Movie \$29, 3 Movies \$65, 5 Movies \$94

SeXxy Graphics with SOUND!

Our EXCLUSIVE 256 color VGA graphics TALK and PLAY MUSIC through your standard speaker.

#010- Top Heavy Memo disk - extremely arse endowed women TALK to you while you admire their HUGE proportions - SIZZLING!

#011- Encounter disk - we can't describe the explicit action you will see and HEAR - absolutely INCREDIBLE!

#012- Summer Disk - You will see the sexiest swimsuits while the girls TALK to you about their turn-ons and turn-offs

#013- Science Fiction Disk - You will see incredible space shots and alien encounters while hearing other-worldly descriptions and music.

Each disk is over 1.2MB - plus FREE DMX with over 2.5MB of utilities for printing, cataloging,

converting to WINDOWS WALLPAPER, and changing the pictures. Req. VGA with 512K

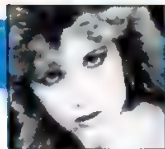
Prices: One disk \$19, 2 disks \$35, 3 disks \$49, 4 disks \$59

ORIGINAL SeXxy DISKS - 6 disk set with movies, pictures, games \$32

ADD \$3 S/H + 3.5% OR FOREIGN ORDERS ADD \$2/DISK - IN PA ADD TAX - MUST STATE AGE OVER 21 YEARS

VISA/MC Orders Only: 800-243-1515 Ext. 600CJ / 24 HRS / 7 DAYS

Or CK MD to: SeXxy Software, P.O. Box 220, Dept. 600CJ, Hatfield, PA 19440



SeXxy Software

SeXxy CD-ROMS

SeXXcapades ... The MOVIE First 600MB Movie for the PC

The most incredible NEW CD-ROM Product! The FIRST complete 600 MB MOVIE with SOUND for the IBM PC. The movie features a group of friends playing out SeXXcapades game. The action is hot and incredible! You will see unbelievable uses of a mouse and joystick. This beautiful 256 color VGA movie fills 3/4 of the screen. You will need at least a 386SX computer. You can pause & Scan as on a VCR. OURS EXCLUSIVELY.

Price: \$129 or \$99 with any other CD-ROM purchase. SeXXcapades game 50% OFF with movie purchase.

SeXxy CD-ROMS

SeXxy CD #1 the premiere adult XXX collection - 980 MB of action with 5268 VGA pictures, 87 movies, 674 stories, games DARE TO COMPARE!

SeXxy CD #2 an exclusive collection containing over 900 Super VGA pictures (1024 x 768 x 256) and over 400 VGA pictures (640 x 480 x 256). These are pictures that cannot be found anywhere else! The women and the quality are stunning.

SeXxy CD #3 another collection of over 650 MB of the hottest pictures available. Over 5,000 VGA pictures, movies and utilities that will have you spending days just trying to see it all!

MENU DRIVEN VIEWING - NO DUPLICATION / PRICE: \$99 each (\$89 with any CD disk or SeXXcapades) / SUPER CD BUNDLE - TAKE ALL 3 XXX CD-ROMS FOR \$199

MIX & MATCH CD-ROMS

First 3: \$99 each or 3 for \$199;

Then: \$69 each or 3 for \$149

ADULT TITLES

MY PRIVATE COLLECTION

PC PIX

EROTICA

SO MUCH STAREWARE

XXX EXTREME

ANIMATION FANTASIES

380ms Internal Drive Kit - \$249

(with 3 CD purchase).

COMMERCIAL TITLES

National Geographic Multimedia Mammals

Autism and Aids

Phoenix Shareware - 4700+ programs, menu driven

Sharklock Holmes Consulting Detective

Magnum Sight and Sound - sounds, pictures, utilities

Chesapeake 2000 - Cross with sound

So Much Shareware - 500 MB of brilliant pictures, videos

Windows CD - 1500 Hires, fonts, icons etc.

Graham Multimedia Encyclopaedia - counts as 2 CD-ROMS

Quality CD-ROM Values HOT XXX ADULT CD-ROMS...

Visual Fantasies

Over 2,600 photo quality pictures in 450 plus megs of the Hottest XXX Adult graphics anywhere! Select your favorite fantasy and enjoy automated slide-show viewing! \$99

Animation Fantasies \$99	Storm Two XXX \$99
So Much Stareware \$97	My Private Collection \$99
Volcano SVGA/XXX \$129	For Adults Only (FAO) \$249
Ecstasy Hot Pics \$99	PC Pix II XXX \$99

Super CD-ROM Specials!

Street Atlas USA	99	Original Shareware	99
Night Owl's 7	85	Battle Cheese MPC	69
Multimedia Darwin	99	Beethoven's Ninth	69
Disc Caddies (12)	79	ProPhone USA	299
Game Pack II	67	RBSB in a Box	99
Elec Home Library	79	Total Baseball	67
Coaste & Art Review	99	Bookshelf (1992)	129
Loom	59	Shelter 7	99

Products also available on diskette

1 (800) 524-3811

Call Now Toll Free

FAX Your Order To:
(310) 947-1131
Call for our
FREE Catalog!
FREE disk caddy for
orders over \$100.

MC/VISA/AMEX, Check/MO,
COD 24hrs/7 days.

PC CompoNet, Inc. 2060 Emery Ave.,
Suite 216, La Habra, CA 90631

Info: (310) 943-9878

CIRCLE 629 ON READER SERVICE CARD

Where Adults Come To Play!

- Local Numbers Covering 850 U.S. and Canadian Cities!
- CHAT Live--In Groups & Private!
- 1000's of Shareware and GIF Files!
- Giant Message Forums!
- Matchmaker Dating Database!
- Interactive Multiplayer Games!
- Travel and Reservations!
- Discount Shopping!
- Women's Groups!
- Tournament Gaming!
- And Much More!

ODYSSEY
ONLINE

For Info, Signup, Or A Local Number Call By Modem (Must Be 18):

818 358-6968

CIRCLE 630 ON READER SERVICE CARD

XXX-RATED CD-ROM

Must state age 21

Other adult CD-ROMs available

Private Pictures 1 (R to XXX rated)\$59.88
The easiest to use adult CD-ROM, completely menu driven. Contains over 600 sharp 640x480x256 color images and 70 hot VGA movies. Includes DOS & Windows utilities.

Volcano (R to X rated)\$99.88
The volcano has almost 1000 different Super VGA 1024x768x256 color images. All images are new and model-released. You will not find these images on any other CD-ROM. DOS utilities included.

Special Offer both discs only \$125 SAVE \$34



24 HOURS / 7 DAYS
US & Canada Orders

800-354-5353

Dealers, catalog information & foreign orders call

Voice 305 - 426 - 4552 FAX 305 - 426 - 9801

Send check/money order to: Starware Publishing Corp.

P.O. Box 4188, Dept. 69 Deerfield Beach, FL 33442

Add \$4.50 S&H Add \$20 for Foreign Express FL add 6% sales tax

Starware BBS 305 - 428 - 0012

CIRCLE 631 ON READER SERVICE CARD

EROS

COMES ALIVE ON
YOUR PC OR MAC!

Experience EROSLink
The Ultimate Online Service

- Uninhibited one-on-one chat and party lines with our exciting hostesses and other callers.
- Sensuous color, publication-quality images for downloading.

Act Today! Get your software and information on how to access EROSLink in your area—

Use your modem (8-N-1) to dial

1-212-254-0969

When asked for ID, enter: EROS

Adults Only!

Floppy & CD-ROM Products

DISK SETS

Set includes 25 color pictures, picture viewer FREE w/ first order, use #889

- #3-10 Sampler, 25 Models\$39.95
- #3-13 Exotics\$39.95
- #3-19 Boris Vallejo\$39.95

1-800-922-3556

FREE color uncensored catalog

w/purchase or send \$5.00 to:

BodyCello P.O. Box 910531,

Sorrento Valley CA 92091

• Order: 1-800-922-3556

• Info: 619-578-6969

• FAX: 619-536-2397

• Include \$4.75 for s/h

• foreign add \$15 s/h

• CA, residents add sales tax

Dealer Inquires Welcome

MUST BE OVER 18 TO ORDER

BodyCello

Breathless from
Erotica CD-ROM 200
Images #9-10, \$199.99

CIRCLE 632 ON READER SERVICE CARD

COMPUTER IMAGES



Use toll-free 800 # to sign up with credit card. Once verified use same 800 # to download files.

1-800-GO-MODEM

Or use direct dial 64 Line BBS at (503) 697-5100 8/N1

Super VGA 1024x768x256

ASTRONOMY * HUGE ADULT AREA SCENIC * GRASP * ANIMATOR * 3D STUDIO MOVIES * SOUND * GAMES UTILITIES * IMAGE CONVERTERS

Event Horizons Commercial BBS, thousands of images and movies. Must be 21 to download from adult areas. Quality Color SuperVGA/EGA. 1200/2400 bps \$12/hr., 9600 bps \$48 hr., 800# \$6/hr. extra. Also Professional Image Scanning from prints or slides to disk.

No Modem? Order our Mail Image Library with samples \$9. Worldwide shipment. Info voice line 503-697-7700. All credit cards accepted. Same day shipment.

EVENT HORIZONS

311 Ave. B, Ste. 209
Lake Oswego, OR 97034
Voice 503-697-7700, BBS
800-466-6336, or BBS
503-697-5100

CIRCLE 633 ON READER SERVICE CARD



"CENTERFOLDS"

On Disk!

See the rest of Ashley's exciting body as well as 50 other models whose adult images are now available for your computer as GIF files

Special Offer Order "VARIETY SET #1 OR #2" Each Variety Set has 25 different GIF images of gorgeous, sexy models. Each Variety Set is only \$39.95 (plus \$4.75 s/h)

Save \$10.00 Order both Variety Sets and see 50 different models. Only \$69.90 (plus \$6.00 s/h)

By ordering now you'll also receive a FREE copy of our 70 page Color Catalog. Each Variety Set contains a picture viewer and is shipped on 3.5" disks (5.25" HD are also available. PLS indicate)

To Order Call (818) 993-5629 Visa/MasterCard accepted. To order by mail send cash, check, money order or credit card info to Centerfolds on Disk ("CoD") P.O. Box 5138 Chatsworth, CA 91313-5138 Or Send \$5.00 for our 70 page Color Catalog

CIRCLE 634 ON READER SERVICE CARD

San Francisco's Premier Adult Gay Men's Online Service has NOW gone Nationwide!

- ▼ Local access from over 1,000 US cities!
- ▼ Live uncensored group & private chat!
- ▼ Online, interactive, multi-player games!
- ▼ Lively salon style public forums!
- ▼ Over 20,000 XXX rated GIFS & files!
- ▼ MatchMaker online databases!
- ▼ 50+ lines available 24 hours a day!
- ▼ Gay owned and operated, your privacy assured!
- ▼ **Much, much more!**

For your local access number, information, & signup, CALL:

(415) 703-8200

Set modem to 8/N/1. You must be 18 or older. Finally...a national adult Gay men's BBS!

EYE CONTACT

CIRCLE 635 ON READER SERVICE CARD

SOFTWARE DUPLICATION

- ◆ Highest Quality Media
 - ◆ Competitive Pricing
 - ◆ 24 Hour Turnaround
 - ◆ Total Quality Assurance
 - ◆ Custom Labels & Packaging
 - ◆ Excellent Service
- We Also Sell & Service Duplication Equipment*

PRINCETON DISKETTE

800 426-0247

1161 BOHANNAN AVE., #111, PLAZA 100, ALBANY, NY 12242

CIRCLE 636 ON READER SERVICE CARD

Ontrack

DATA RECOVERY



- International & Domestic Data Recovery
- Hard Drive Repairs
- Floppy Disk Repairs
- Expertise with Novell, DOS, Macintosh, & 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 27.0, 28.0, 29.0, 30.0, 31.0, 32.0, 33.0, 34.0, 35.0, 36.0, 37.0, 38.0, 39.0, 40.0, 41.0, 42.0, 43.0, 44.0, 45.0, 46.0, 47.0, 48.0, 49.0, 50.0, 51.0, 52.0, 53.0, 54.0, 55.0, 56.0, 57.0, 58.0, 59.0, 60.0, 61.0, 62.0, 63.0, 64.0, 65.0, 66.0, 67.0, 68.0, 69.0, 70.0, 71.0, 72.0, 73.0, 74.0, 75.0, 76.0, 77.0, 78.0, 79.0, 80.0, 81.0, 82.0, 83.0, 84.0, 85.0, 86.0, 87.0, 88.0, 89.0, 90.0, 91.0, 92.0, 93.0, 94.0, 95.0, 96.0, 97.0, 98.0, 99.0, 100.0

1-800-872-2599

610-872-2599 / 610-872-2599

CALL 1-800-872-2599 / 610-872-2599

5000 Valley Dr., Allentown, PA 18106

CIRCLE 638 ON READER SERVICE CARD

TS TECHNICAL PROGRAMMING SERVICES, INC.

■ Tape & Cartridge ↔ Floppies
(\$2.00 → \$15.00/MB)

- Microfiche
- High Speed Laser Printing
- High Speed Bar-Code Mailing

1-800-422-9622
Supported Media

- 9 track • 3480 • TK50 • TK70 •
- 8mm • 1/4" Cartridge •
- 3-1/2," 5-1/4," & 8" Floppies •

8508 EAST 61ST STREET, SUITE 116
TULSA, OK 74133-1920
PHONE 918-254-9622

CIRCLE 639 ON READER SERVICE CARD

DUPLICATION FROM \$.54

HIGHEST QUALITY MEDIA

MS DOS duplication from **\$.54** (5.25") and **\$.88** (3.5"). Prices go even lower as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves/Mailers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 640 ON READER SERVICE CARD

THE NEW PC MAGAZINE CLASSIFIED FORMAT GIVES YOU MUCH MORE FOR FAR LESS...

- New Flexible Ad Sizes
- More Color Options
- Lower Cost-per-Inch Rates



Call your PC Magazine Marketplace account representative today at:

1-800-825-4237

and let the new Classified work for you.

◆ SOFTWARE ◆ DUPLICATION

- Disks & Tapes •
- Package Design •
- Packaging & Assembly •
- Printing •
- Fullfillment •
- Inbound Tele-Sales •

◆ EQUIPMENT ◆

- Disk Duplicators •
- Label Printers •
- Sleevors •
- Leasing •
- Maintenance •



Rimage Distributor

MEGAsoft

(800) 222-0490

FAX: (908) 462-5658

819 Hwy. 33 E.
Freehold, NJ 07728

CIRCLE 641 ON READER SERVICE CARD

QUALITY CONVERSIONS

**Disk - Tapes
Scanning**



**Cartridges
Fiche - Film**

*Your Complete
Imaging Source Center!*

Free Test - Fast Service

1ST RUN Computer Services Inc.
1261 Broadway, Suite 508
New York, NY 10001
(212) 779-0800 - (800) 833-2207

CIRCLE 642 ON READER SERVICE CARD

CONVERSIONS between Word Processors OCR SCANNING of documents DUPLICATION of diskettes/tapes

2500 Word Processing &
Computer Formats, 3 1/2",
5 1/4", 8" DISKS, 9-TRACK,
3480, 8mm, 4mm, TK50 TAPES,
1/4" Tape Cartridges, Syquest &
Bernoulli Cartridges, magcards,
cassettes

Quality Media
Quickest turnaround
Guaranteed Satisfaction

**COMPANY
COMPENDIA, INC.
1-800-374-DISK**

Ph: 312-419-8771 Fax: 312-419-1390

CIRCLE 643 ON READER SERVICE CARD

DATA CONVERSION

DISKS • TAPES • CARTRIDGES
CONVERSION-DUPLICATION-SCANNING

MORE FORMATS THAN ANYONE!

Quick • Reliable • Quality

WORD PROCESSORS, MINIS
MICROS, SPREADSHEETS
DATABASES, MAIL LISTS

IBM, DEC, APPLE, WANG
HP, WordPerfect, MS-Word



Lotus
Dbase
MICOM
LANIER
CPT, NBI
DISPLAYWRITER
8/4MM, XEROX, CP/M, UNIX ...

NATIONAL DATA CONVERSION

5 East 16th Street, New York, NY 10003

(212) 463-7511

AMERICA'S LEADERS IN DATA CONVERSION

CIRCLE 645 ON READER SERVICE CARD

STOP THROWING
AWAY

**TONER
CARTRIDGES**

Empty Cartridges Recycled
Guaranteed To Work Like New

From
\$36

FREE U.P.S. PICK-UP & DELIVERY

National Toner
Recycling & Supply

(800) 676-0749

CIRCLE 647 ON READER SERVICE CARD

TONER

Cartridges Remanufactured

WE BUY EMPTIES! **\$44**

■ Visa, MC, Amex
■ ALL MAJOR BRANDS!

■ 100% Money Back
Guarantee

■ FREE DELIVERY,
Fast Turnaround

■ "Super Drum"
Cartridges Available

■ Full Line of
DISCOUNTED SUPPLIES

Laser Renew of CT
1-800-347-4221
55 Corman Hill Road, #1
New Milford, CT 06776-4509

CIRCLE 646 ON READER SERVICE CARD

**BULK
DISKS**

SONY • DYSPAN • VERBATIM

	QTY 250	
	BLANK	FORMATTED
5 1/4" DS/DD	.33	.39
5 1/4" DS/HD	.42	.54
3 1/2" DS/DD	.53	.68
3 1/2" DS/HD	.86	1.05

5 1/4" INCLUDE SLEEVES/24 HOUR SHIPPING

800-426-0247

We also sell and service
duplication equipment and
disk duplication services.

**PRINCETON
DISKETTE**

1101 Richmond Ave., Pt. Pleasant Bch., NJ 08742

CIRCLE 648 ON READER SERVICE CARD

DATA CONVERSION

If you want
the most
complete
conversion
services in the industry,
just call...

(800) CONVERT

Capabilities include over 3000 formats

**PIVAR
COMPUTING SERVICES, inc.®**

165 Arlington Heights Rd. #M
Buffalo Grove, IL 60089
(708) 459-6010

"PC Thefts Skyrocket 400 Percent"

-Computer Shopper Aug. '92

"Call it another sign that PC's entered
the mainstream. A black market in stolen
computers reached epidemic proportions
in the last year..."



SAFWARE

INSURES YOUR
COMPUTERS

Full replacement of hardware,
media, purchased software. As
low as \$49 yearly. Covers fire,
theft, power surges, other acci-
dents. Blanket coverage: no list of
equipment needed. Call for infor-
mation or immediate coverage.



1-800-848-3469
Local-614-262-0559

SAFWARE The Insurance Agency Inc
2929 N. High Street P.O. Box 02211
Columbus, OH 43202

CIRCLE 644 ON READER SERVICE CARD

It's A Jungle Out There!

**But PC Magazine Classified Delivers
The Lion's Share of the Market.**

PC Magazine makes seller easier by delivering
responsive direct buyers twice monthly.

PC Magazine ads trigger immediate response
and direct sales.

Call your PC Magazine Marketplace
account representative today at:

1-800-825-4237



Source: PC Magazine Direct Market Subscriber Study 1992 (past 12 months)

IT'S AS EASY AS 1 2 3

1. Fill in your name and address and check off your answers to the nine research questions. 2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about. 3. The literature will be mailed to you from the advertiser free of charge.

Valid after May 31, 1993

CIRCLE FOR FREE INFORMATION

001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035												
036	037	038	039	040	041	042	043	044	045	046	047	048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082
083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317
318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364
365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411
412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458
459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505
506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552
553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599
600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646
647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693
694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787
788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834
835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881
882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928
929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975
976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022
1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069
1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116
1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163
1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200										

PC 1/26-6

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one only.)

01. ☐ Manufacturer of Computer Equipment, Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities
17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service
99. ☐ Other

3. Please indicate your primary business function: (Check one only.)

01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply.)

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply.)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC Products?
01. ☐ Now

02. ☐ In 4 to 6 months
03. ☐ In 7 to 12 months
04. ☐ No definite plans

9. Number of Employees in your entire company:

01. ☐ 25 or less
02. ☐ 26-99 04. ☐ 500-999
03. ☐ 100-499 05. ☐ 1000 or more

PLEASE PRINT CLEARLY

Name

Title

Telephone

Company Name

Address

City

State

Zip

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

Free Product Information

BUSINESS REPLY MAIL</

Free Product Information

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687



PC

READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about
3. The literature will be mailed to you from the advertiser free of charge

Valid after May 31, 1993

CIRCLE FOR FREE INFORMATION

036	037	038	039	040	041	042	043	044	045	046	047	048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------

1. Do you work in a DP/MIS department? 01. ☐ Yes 02. ☐ No	16. ☐ Agriculture/Construction/Mining/ Oil/Transportation/Utilities 17. ☐ Non-Computer Retailer/Distributor 18. ☐ Other Business or Service 99. ☐ Other	4. Is your company a reseller? 01. ☐ Yes 02. ☐ No	9. Do you plan to buy any PC Products? 01. ☐ Now 02. ☐ In 4 to 6 months 03. ☐ In 7 to 12 months 04. ☐ No definite plans
2. Please indicate your company or organization's primary business activity: (Check one only) 01. ☐ Manufacturer of Computer Equipment, Computers, Software 02. ☐ Manufacturer—Aerospace 03. ☐ Manufacturer—Other 04. ☐ Systems House 05. ☐ Computer Consultant 06. ☐ Computer Retailer/VAR/VAD Distributor 07. ☐ Communications 08. ☐ Finance/Banking/Insurance/ Real Estate/Accounting 09. ☐ Education 10. ☐ Government—Federal 11. ☐ Government—Non-Federal 12. ☐ Research and Development 13. ☐ Data Processing/Computer Service 14. ☐ Health/Medical/Legal Service 15. ☐ Engineering/Architecture	3. Please indicate your primary business function: (Check one only) 01. ☐ DP/MIS 02. ☐ Systems, Programming 03. ☐ Communications 04. ☐ Engineering 05. ☐ Res./Dev./Scientific 06. ☐ Accounting/Finance 07. ☐ Computer Consulting 08. ☐ Purchasing 09. ☐ Operations 10. ☐ Production 11. ☐ Education/Training 12. ☐ Marketing/Sales 13. ☐ Medical/Legal 14. ☐ Admin./Mgmt. 99. ☐ Other	5. For how many IBM PCs and compatibles do you specify brands of products: 01. ☐ 10 or less 03. ☐ 26-99 02. ☐ 11-25 04. ☐ 100 or more	9. Number of Employees in your entire company: 01. ☐ 25 or less 02. ☐ 26-99 04. ☐ 500-999 03. ☐ 100-499 05. ☐ 1000 or more
PLEASE PRINT CLEARLY			
Name _____			
Title _____		Telephone _____	
Company Name _____			
Address _____			
City _____		State _____ Zip _____	
☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.			

TONER CARTRIDGES

REMANUFACTURED

TESTED - GUARANTEED - 24-HR TURNAROUND
HP, APPLE, CANON, IBM, etc. Laser Cartridges
Canon/Sharp Z Toner/Xerox Copier Drum Cartridges

PRICES FROM
\$45
SHIP. INCL.

LASER CHECK PRINTING

MICR Toner, Fonts, Software for Laser Check Printing
Color Toners for Most Laser Printers
OPC Cartridges and Toner for almost all laser printers

\$10 coupon on first order
offered when you respond
to ad with Reader
Service Card

Call **1-800-239-4027**
FAX 1-800-653-3406

ADVANTAGE
LASER PRODUCTS, INC.

1929 Queen City Ave. Tuscaloosa, AL 35401
2030 Powers Ferry Rd STE 218 Atlanta, GA 30339

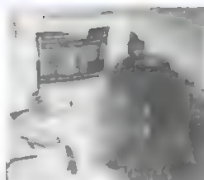
Over 140,000 pounds of toner cartridges (35,000 carts) recycled since 1987

CIRCLE 649 ON READER SERVICE CARD

NO MORE MESS! NO MORE CLUTTER!

COMPUTER REFERENCE WALL

NEW!



Why put up with this?



When you can have this

The Computer Reference Wall puts notes, commands and reference material at the operators fingertips. Two attractive transparent panels on unique "up-or-out" hinges provide instant access.

Save time save money Panels double as a convenient 2-page copy holder using clips that are included. Available in 2 sizes means fast turnover too.

**VIZIFLEX
SEELS, INC.**

Call, write or Fax:

16 E. Lafayette St.
Hackensack, NJ 07601
201-487-8080
Fax 201-487-6637

CIRCLE 652 ON READER SERVICE CARD

FORMATTED DISKETTES

5 1/4" 360K	35 ¢	3 1/2" 720K	53 ¢
5 1/4" 1.2mg	47 ¢	3 1/2" 1.4mg	93 ¢

BULK TAPES

2000	\$12.60	2120	\$16.00
6150	\$17.60	6320	\$22.50
4mm 1.3Gb	\$13.00	8mm 2.3Gb ...	\$12.80

SONY • VERBATIM • BASF
ALSO AVAILABLE

Price per disk in lots of 300, subtract \$.04 for unformatted
Tapes in lots of 10. Mix and match any format or size



MEGAsoft

(800) 222-0490



FAX: (800) 222-0490 • E-MAIL: MEGA@MEDIASOURCE.COM • WWW: MEGA.MEDIASOURCE.COM

CIRCLE 650 ON READER SERVICE CARD

Fast Service, High Quality & Low Prices... That's Media Source.

GENERIC DISKS
100% Guaranteed

	Qty./100		Qty./100
5.25 DS/DD	.23¢	3.5 DS/DD	.47¢
5.25 HD	.37¢	3.5 HD	.69¢

NAME BRAND BULK

VERBATIM	Qty./100
5.25 DS/DD	.29¢
5.25 HD	.46¢

BULK O.E.M.
Duplicator Grade

	Qty./100
5.25 DS/DD	.25¢
5.25 HD	.38¢
3.5 DS/DD	.49¢
3.5 HD	.74¢

NAME BRAND BULK

SONY	Qty./100
3.5 DS/DD	.57¢
3.5 HD	\$1.10

SAME DAY SHIPPING
On orders received before 2 pm E.S.T.

**media
source**

SINCE 1986

FAX (404) 952-1432 800-356-2553

AR 5.25
Include
Sleeves

CIRCLE 651 ON READER SERVICE CARD

FORMATTED DISKETTES BASF, VERBATIM, SONY

WITH FORMAT	QTY 250 MIX & MATCH	WITHOUT FORMAT
\$.41	5.25" DS/DD	\$.36
\$.62	5.25" DS/HD	\$.54
\$.63	3.50" DS/DD	\$.53
\$.99	3.50" DS/HD	\$.89

- **FREE FORMATTING** on first order
- **TYVEC SLEEVES** & Labels Included
- **COLOR MEDIA** Please Add \$.05
- **VOLUME DISCOUNTS** Available
- **SAME DAY** Shipping
- **MONEY BACK GUARANTEE**

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah, WA 98027

CIRCLE 653 ON READER SERVICE CARD

It's A Jungle Out There!

*But PC Magazine
Classified Delivers
The Lion's Share
of the Market.*

PC Magazine makes selling easier by delivering responsive direct buyers twice monthly.

PC Magazine ads trigger immediate response and direct sales.

*After reading an ad
in PC Magazine...*

- **60% of PC Magazine subscribers buy direct**
- **55% of PC Magazine subscribers write/phone company for product information**
- **47% of PC Magazine subscribers recommend the product to someone else**

*With response like
this, your business
will do more than
just survive!*

Call your
PC Magazine Marketplace
account representative
today at:

**1-800-
825-4237**

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$715, 3 issues—\$625, 6 issues—\$605,
12 issues—\$570, 17 issues—\$545, 22 issues—\$535.
Multiple-ad per issue rates also available.
Prepayment must accompany each insertion.
VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish type-written copy. Ads include: 1) Headline (1 line, initial caps=30 characters max, all caps=25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.
Please send copy and payment to:
PC Magazine BusinessCard
One Park Avenue, 3rd Floor
New York, NY 10016
For more information, call 800-825-4237 or 212-503-5175, FAX: 212-503-5860.

HARDWARE/ADD-IN-BOARDS

LEARN PARALLEL PROCESSING

- Transputer Education Kit
- PC add-in board with transputer & 1MB mem
- T400 C & Occam2 compilers & debuggers
- 1500 pages of documentation with schematics
- Only \$396 Visa-MC-A/X accepted

Computer System Architects

15 North 100 East, #100, Provo, UT 84606-3100
(801) 374-2300 • (800) 753-4CSA

CIRCLE 801 ON READER SERVICE CARD

CREATE YOUR OWN PERSONAL CDI

We can transfer up to 640MB of information to ONE CD-ROM - For just \$269! We will take your cartridges, DAT, or other media, and within days create a Personal CD. Call for details and ordering information.

NEXUS SYSTEMS, INC.

333 Westbury Avenue, Carle Place, NY
(516) 338-5549

CIRCLE 806 ON READER SERVICE CARD

IBM, MAC, H.P. EVEREX

- HOT NEW PRODUCTS • SERVICE WITH INTEGRITY
- ROCK SOLID RELIABILITY: Omnibus is known the world over for computers and peripherals:
- COMPAQ • NETWORKING • IBM COMPATIBLES.

M/C, VISA

Omnibus Computers Inc.

1933 Davis Street #296, San Leandro, CA 94577
Tel: 510-430-2706 Fax: 510-430-2709

CIRCLE 811 ON READER SERVICE CARD

CD-ROM

CD-ROM CADDIES

Protect your disc from fingerprints, dust & scratches. Professional Quality, Industry Standard. Official Licensed Product - Made in USA. Also in stock: CD-ROM STORAGE UNITS, DISK CLEANERS, LASER LENS CLEANERS. Dealer Programs avail. Visa/MC.

QB PRODUCTS

1260 Karl Ct. Wauconda, IL 60084
Phone: 800-323-6856 Fax: 708-487-2689

CIRCLE 802 ON READER SERVICE CARD

\$200 Billion Gov't Marketplace

On BID-DISC Weekly CD-ROM. Entire Commerce Business Daily indexed on Folio software.
Special: \$49 CD-ROM drive with 1 yr subscription
• 10 weeks \$95 • 6 months \$495 • 1 year \$950.
Offer expires 3/31/93. Visa/MC/PO's

Call Panatech

1-800-766-5824 Fax: 205-883-3526

CIRCLE 807 ON READER SERVICE CARD

LAPTOP/PORTABLES

Free Portable Computer Catalogue

We carry the top 21 brands and sell by phone at competitive prices. We will try to beat any legitimate price. 100% money back guarantee. No restocking. Fleet pricing available. VISA, MC, Amex, Discover, COD, PO's ok.

Penguin Portables

CALL 1-800-241-1096

CIRCLE 812 ON READER SERVICE CARD

COMMUNICATIONS/NETWORKING

FREE CD-ROM DISCOUNT CATALOG!

Hundreds of discounted CD-ROM titles, from \$8 up. Call or write for your free catalog.

Ellis Enterprises, Inc.

4205 McAuley #385, Oklahoma City, OK 73120
1-800-729-9500

CIRCLE 803 ON READER SERVICE CARD

KEYBOARD, VIDEO, MOUSE

EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS Up to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION

2800H Bob Wallace Ave., Huntsville, AL 35805
PHONE 205-534-0011 FAX 205-534-0010

CIRCLE 808 ON READER SERVICE CARD

Notebooks at Discount Prices

We carry the Dynova SLic3000, 7 hours battery life & made in the USA. Base unit comes with 85MB HDD exp to 220, 2MB RAM exp to 8, 1.44 MB FD, DOS 5.0A, Bag & Charger. 1 year parts & Labor Warranty \$1799.+S/H.

NEPCO Electronics Corp.

123B West Hampden Ave., Suite 259, Englewood, CO 80110 Tel: 1-800-528-2322

CIRCLE 813 ON READER SERVICE CARD

WALNUT CREEK CDROM

Simtel20: 6000+MS-DOS programs. \$24.95
CICA: all sorts of MS Windows stuff \$24.95
Source: 600+megs. C, pascal, etc. \$39.95
Desktop Library: disc full of books \$39.95
MC/Visa. Money back guarantee (510) 947-5996

WALNUT CREEK CDROM

1547 Palos Verdes, Walnut Creek, CA 94596
1 (800) 786-9907 Fax: 1 (510) 947-1644

CIRCLE 804 ON READER SERVICE CARD

VOICE MAIL - FAX - NOW!

PC-Based Voice Mail and Call Processing systems - Over 50,000 sold. Order taking, Faxback, Info. systems, xfers, & telemarketing • Developer, VAR, and OEM packages • Multiline screamers in stock • Fully Warranted - Lowest Prices! CALL NOW!

Talking Technology Inc.

1125 Atlantic Ave. Alameda, CA 94501
800-934-4884 510-522-3800 Fax 510-522-5556

CIRCLE 810 ON READER SERVICE CARD

SOFTWARE/ACCOUNTING

THE EASIEST OF THEM ALL™

Full featured FoxPro based Integrated Accounting for PC's. Faster, More Complete and Easier to Use, See PC Magazine May 12, 1992. Only \$295.00 Call for free info kit, demo disk and upgrade offer.

PC ACCOUNTANT™

P.O. Box 2278, Kirkland, WA 98083
800-827-1303 206 827-4361

CIRCLE 814 ON READER SERVICE CARD

COMPUTER SYSTEMS

386/486 WHOLESALE BLOWOUT

386-33: \$1159 386-40: \$1169 486-SX20: \$1269
486-33: \$1459 486-50: \$1799
4MB RAM, 1.2 & 1.44FD, 130MB HD, SVGA .28,
SVGA w/1MB.KB101, I/O, Mouse 1 Yr. Wmty. CR
CRD ACCEPTED WILL MATCH OR BEAT ANY PRICES

ONE STEP AHEAD SYSTEMS

P.O. Box 832482, Richardson, TX 75080
(800) 886-0808 FAX (214) 234-3478

CIRCLE 810 ON READER SERVICE CARD

NIGHT OWL'S Shareware CDs

PC Mag Special Each 650mg 10,000 files, zipped w/retrieval. Also set-up for PCBoard. Few dupes between versions. v4.2 US\$55 C\$70, v5 or v6.1 or v7 • US\$65 C\$80, delivered. Canada+GST/OPST
Check/Visa. Dealer Inq. welcome. late 9/92

Integrated Data Systems

120 27th St #3, Etobicoke, ON CDA M8W 2X7
(416) 252-1132 (voice eve.) BBS 416-252-1133

CIRCLE 805 ON READER SERVICE CARD

MULTIPLY—

Your sales by handing your business card to over 900,000+ buyers at one time in the place where they seek to buy—tell them about your product in PC Magazine Marketplace BusinessCard.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 815 ON READER SERVICE CARD

BUSINESS

BlankCheck - Now for Quicken®

Use 1 blank form and print checks for up to 300 checking accounts on your HP laser printer using your Quicken software & our BlankCheck kit. Supports voucher, standard, & wallet checks. Complete kit with software, MICR toner & forms only \$799.

SouthData, Inc.

PO Box 1703, Mt. Airy, NC 27030 800-628-7227
In Canada: Capriole Software 416/288-1266

CIRCLE 816 ON READER SERVICE CARD

COMMUNICATIONS/NETWORKING

FileWizard

Analyze NetWare server by user, volume, directory, and file extension, over time. Create action/archive strategies to fit your specific needs. Users retrieve archived files. Full range of Graphical analysis, printed reports & forecasting.

Knozall Systems, Inc.

375 E. Elliot Rd., Ste 10, Chandler, AZ 85225
800-333-8698 602-545-0006/Fax 545-0008

CIRCLE 817 ON READER SERVICE CARD

PC VOICE MAIL KIT \$1795

- Voice Processing on your PC • Software and 4 line board included • Order Taking • AUDIOTEX
 - Voice Messaging • Never miss another call!
 - HUNDREDS OF USES • Don't pay \$1,000's
- CALL TODAY FOR Free DETAILS • 2yr warranty

Amerifax Services Corp.

572 W. Market St. #5, Akron, OH 44303
(216) 253-8787 • (216) 762-6050 Demo

CIRCLE 818 ON READER SERVICE CARD

IND\$FILE • 3164 • VT100 for PC/Macs

File transfer, terminal emulation, remote takeover, script encryption • Trace facility • Editor • Customizable Colors • User-definable keyboards • Scripting • Full-featured demos.
RCOM/MF for TSO, CICS, CMS, ICCF, DOS/BAT.

COMPUTER VECTORS, Inc.

74-5599 Luhia St., #E-7, Kailua-Kona, HI
800-262-RCOM 808-329-6646

CIRCLE 819 ON READER SERVICE CARD

COMPUTER LANGUAGES

REXX AND NOVU

REXX/Windows™	\$149.00
Portable/REXX for MS/DOS	\$30.00
REXX4NT™	Call
Novu™ Colorful Windows editor	\$30.00
SAA compatible No royalties	Visa/MC

Kilowatt Software

(800) 848-9474 Phone & FAX
(614) 866-4300 Phone & FAX

CIRCLE 820 ON READER SERVICE CARD

FORTRAN LANGUAGE SYSTEMS

32-bit and other PC Fortran compilers to meet your programming needs. Editor's Choice & Tech Excellence Winners. • Call 800-548-4778 •

LAHEY COMPUTER SYSTEMS

BOX 6091, Incline Village, NV 89450
Tel: 702-831-2500 Fax: 702-831-8123

CONSTRUCTION

SERVICE MANAGEMENT SOFTWARE

Instant access to customer history. Automated dispatching. Timely billing. Take charge of your business with CMAS Plus, our integrated accounting/job costing/service management system for specialty contractors. Call for free demo.

DATA-BASICS, INC.

11000 Cedar Road • Cleveland, OH 44106
1-800-837-7574 • Fax (216) 721-2398

CIRCLE 822 ON READER SERVICE CARD

DATA BASE

COMPOSE™ Object Database

Object-oriented, menu-driven queries mingled with C methods. C/C++ interfaces to query/object managers. Extensible for multimedia. Open Architecture. Support Borland C/C++, Turbo C/C++, MS C/C++, Quick C. DOS and Windows. \$249

Object Technology, Inc.

P.O. Box 8203, Somerville, NJ 08876
(908) 369-6519 FAX: (908) 369-6529

CIRCLE 823 ON READER SERVICE CARD

dBASE file access from C, Basic,....

CodeBase 5.0 gives complete database management with multi-user dBASE, FoxPro or Clipper file compatibility from C, C++, or Visual Basic. Full 90 day money back guarantee. Order now for a FREE CodeReporter or call now for a FREE demo.

SEQUIER SOFTWARE

#209, 9644-54 Ave, Edmonton, AB, Can. T6E 5V1
Call (403) 437-2410, Fax (403) 436-2999

CIRCLE 824 ON READER SERVICE CARD

DATA ENTRY

VIKING DATA ENTRY SYSTEM

- Software for Data Entry Professionals
- Advanced Validations & Re-key Verify
- Used by U.S. Census & 26 of Fortune 50
- MS/DOS, UNIX, VMS, AIX Versions
- Free Preview Demo

Viking Software Services, Inc.

4808 E. 67th St., Tulsa, OK 74136
(800) 324-0595 FAX: (918) 494-2701

CIRCLE 825 ON READER SERVICE CARD

DIAGNOSTIC

"PINPOINT ANY PC FAILURE"

...says John Dvorak, PC Magazine 6/30/92. Top-rated PocketPOST Power-on Self Test card plus diagnostic software for ISA/EISA/Micro-Channel. 180-page manual. Hones your trouble shooting skills. CALL NOW

DATA DEPOT, INC

1710 Drew St #5, Clearwater, FL 34615
800-767-3424/813-446-3402 FAX: (813)443-4377

CIRCLE 826 ON READER SERVICE CARD

EDUCATION

Electronics & Microelectronics

An easy to use tutor: simple circuit components to microprocessors. Hundreds of diagrams, lots of animation. Four 5.25" disks or two 3.5" diskettes. Single user \$199; multiple \$399; demo \$5; air mail postage included. VISA/MC

MicaSOFT

45 Heol Frank, Swansea SA5 7AS, Great Britain.
Phone 44-792-584388 Fax 44-792 581052

CIRCLE 827 ON READER SERVICE CARD

ENGINEERING

SIMULATION

GPSS/PC™ is full-power version of the most popular mainframe simulation language, GPSS. Designed for interactive use on high-speed microprocessors. It has 6 graphics and animation windows. It predicts behavior of complex systems.

MINUTEMAN SOFTWARE

P.O. Box 171/B, Stow, MA 01775
800-223-1430/508-897-5662 Ext.316

CIRCLE 828 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

Computer Screens That Sizzle!

The sexiest VGA Selections at Low, Low Prices. Freebies, Special offers & Instructions. Easy to Use & Fast Delivery. Must be 18 to order.

STARE

P.O. Box 17974, Milwaukee, WI 53217
Call (414) 466-3381

CIRCLE 829 ON READER SERVICE CARD

FOREIGN LANGUAGES

French, Spanish, German, Russian

We stock a full line of top quality unidirectional and bidirectional PC translation software. English to French from \$69.95 (our own). English to Spanish from \$129.95. \$5 S&H. Visa/MC. Give us a call with your foreign language software needs.

Fluensys Corporation

10451 Mill Run Circle, Suite 400
Owings Mills, MD 21117 (800) 243-4470

CIRCLE 830 ON READER SERVICE CARD

HEALTH

Nutrition & Fitness Software

The TOP-Rated Software. Lose weight! Plan workouts! Control fat, cholesterol, salt! Plan/analyze menus! GET RESULTS! Personal & professional software. 50+ functions, terrific reports, 2000-11,500 foods. From \$29 - \$995. FREE Demo Disk.

ESHA Research

POB 13028M, Salem, OR 97309-1028
503-585-6242 fax: 503-585-5543

CIRCLE 831 ON READER SERVICE CARD

INVENTORY

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 832 ON READER SERVICE CARD

We Make It So Easy—

Leave your business card with us and we'll do the rest. PC Magazine will create your BusinessCard for you. It's so easy—and so very effective.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 833 ON READER SERVICE CARD

INVENTORY

INVENTORY PROBLEMS SOLVED!

Track Expendable Inventory (Internal Stockroom), Fixed Assets, Bids, and Purchase Orders. Bar code option. Eliminate waste, over/under stock, etc. Auto reorder, tracks usage by dept., item, and GL No. Prints 360 error-free PO's per hour! Demo disk.

Certified Management Software, Inc.

142 East 200 South SLC, UT 84111
TEL (801) 534-1231 FAX (801) 363-3653

CIRCLE 834 ON READER SERVICE CARD

dFELLER Inventory

Business inventory programs written in modifiable dBASE source code. dFELLER Inventory \$150, dFELLER PLUS \$200 with History and Purchase Orders (Good for Stockrooms) Requires dBASE III PLUS, or dBASE IV.

Feller Associates

550 CR PPA, Route 3, Ishpeming, MI 49849
906-486-6024

CIRCLE 835 ON READER SERVICE CARD

MAILING PROGRAMS

Make Ready for the Global Market!

"Global-Z" - the International Mail Management System, makes US/CAN and global mailings easy and accurate. Labels, envelopes, reports, import/export. "ELF 1.0" - complete mail order system (integrated with "Global-Z") V/MC/AMEX.

DASSGAR SYSTEMS, INC.

PO Box 915, Bennington, VT 05201
(802) 447-3978 (718) 539-5220

CIRCLE 836 ON READER SERVICE CARD

MAINTENANCE/PREVENTIVE MAINTENANCE

MAINTENANCE MANAGEMENT

PC-based system for the small to medium size business. FEATURES: Work Orders (space for detail instructions & safe work procedures), equipment descriptions, historical data, operating & analytical reports, inventory. Write for free Demo!!

PENGUIN COMPUTER CONSULTANTS

P.O.Box 20485, San Jose, CA 95160
800-521-0545 (408)997-7703 Fax(408)927-0570

CIRCLE 837 ON READER SERVICE CARD

MAINTAIN! CONSERVE! MANAGE!

Equip, Assets, Vehicles, Bldgs, HVAC, Everything! Work Orders, Procedures, Resources, inventory, Purch Orders, Energy, Utility Bills, Rate Anal. All in "C", w/Btrieve, DOS/Windows, Mouse/KB 45 day full prog for S/H cost: \$10. Visa/MC

GENERAL ENERGY TECHNOLOGIES

250 E. 17th St., Costa Mesa, CA 92627
Tel: 714-645-7733 Fax: 714-645-7747

CIRCLE 838 ON READER SERVICE CARD

MEDICAL

PRACTICE BILLING

MD VersaForm, flexible, ledger based design, billing package. Programmable; customizable reports, files, & screens; includes database mgmt system & full source. ECS. LAN support. \$1,295 (sg) user. Free lit & demo. Dirs wanted.

Applied Software Technology

591 W. Hamilton Ave., Ste 201, Dept. 99
Campbell, CA 95008 (800) 678-1111 Ext. 99

MUSIC

SongWright Out Scores The Rest

"Impressive output...solid list of features."
An Electronic Musician survey proves SongWright the BEST BUY of all music notation software. Save hundreds of dollars. Make your music easy with SongWright. Only \$119.95.

SongWright Software

7 Loudoun Street S.E., Leesburg, VA 22075
(800) 877-8070 (703) 777-7232

CIRCLE 840 ON READER SERVICE CARD

PROGRAMMERS TOOLS

Boost Your BASIC with ProBas 5.51

• Adds 938 new commands to QB/PDS/VBDOS
• Written in assembly for speed • Gives your programs a professional look • Easy-to-use, \$back guarantee • 17 Other add-ons for BASIC, C & VB; FREE DEMO DISK AND BOOKLET

TeraTech

100 Park Ave. #360 (D197), Rockville, MD 20850
(800) 447-9120 ext.197 Fax: (301) 762-8185

BASIC PROGRAMMING TOOLS

Crescent offers many tools for QuickBASIC, PDS, and Visual Basic, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

CRESCENT SOFTWARE, INC.

11 Bailey Avenue, Ridgefield, CT 06877
Orders: 800-35-BASIC, Tech: 203-438-5300

Translate dBASE programs to C

CodeTranslator converts dBASE programs into working C applications. This turbo charges slow dBASE applications, helps you port to Unix, MS Windows, or OS/2, and helps dBASE programmers learn C easily. Call now for more info.

SEQUITER SOFTWARE

#209, 9644-54 Ave, Edmonton, AB, Can. T6E 5V1
Call (403) 437-2410 Fax (403) 436-2999

CIRCLE 843 ON READER SERVICE CARD

Powerful Turbo Pascal Tools

Libraries from TurboPower help you develop Turbo Pascal applications easier and faster. Experts say "An Essential Toolkit", "Outstanding", OOP and non OOP libraries, BTree, Async and more. Call or write for a FREE brochure.

TurboPower Software

P.O. 49009 Colorado Springs, CO 80949-9009
(800) 333-4160, FAX (719) 260-7151

PUBLIC DOMAIN/SHAREWARE

BEST-SELLING SOFTWARE

100 most popular and useful SHAREWARES selected from many categories and packed into 10-20 LIFE-TIME GUARANTEED diskettes. FREE Exchange privilege any time from our rich 40,000+ programs library. Only \$19.95. Please specify disk size.

USA SHAREWARE

1350 Beverly Rd, Ste. 115-324, McLean, VA 22101 Tel: (703) 883-4666

CIRCLE 845 ON READER SERVICE CARD

REAL ESTATE

The Landlord® & The Landmaster®

Property management software purchased by more than 5,000 owners and property managers since 1980. Handles residential and commercial tenant accounting; prints checks and statements. G/L and A/P included. From \$595 to \$2200.

The Landlord Software Center

427 East Patrick Street, Dept. E
Frederick, MD 21701 (301) 695-1544

CIRCLE 846 ON READER SERVICE CARD

Property Management

Software for managing residential, commercial, condos, etc. Basic version for owner/manager- \$495, Deluxe for professional managers- \$1,195, Network- \$2,395. Includes check writing, recurring expenses, G/L, management reporting.

YARDI SYSTEMS, INC.

819 Reddick Street, Santa Barbara, CA 93103
(805) 966-3666

CIRCLE 847 ON READER SERVICE CARD

Property Management

With Rental-Ease save \$\$ on your investment! Guaranteed to be the easiest & fastest property management system available at any price. Versions for owners, professionals, networks. \$395 to \$1295, Demo \$10. Dealers welcome!

Strategic Office Systems

688 N. 500 W. #61, Mt. Pleasant, UT 84647
(800) 942-6784 or (801) 462-2130

CIRCLE 848 ON READER SERVICE CARD

RELIGION

Bible Study Software

For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems

2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

STATISTICS

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

329 North 1000 East, Kaysville, UT 84037
Phone: 801 546-0445 FAX: 801-546-3907

CIRCLE 850 ON READER SERVICE CARD

Shake Hands

With over 900,000+ of the most qualified PC buyers in the market—right here—in PC Magazine Marketplace BusinessCard.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 851 ON READER SERVICE CARD

STATISTICS

WinSTAT™ Statistics for Windows

All the statistics you need, all the convenience of Windows! Up to 65,000 variables/cases. Copy/paste data from your spreadsheet. Output tables/graphs to your word processor. Complete package \$395. Demo \$10. Call for brochure. V/MC/PO.

Kaimia Co. Inc.

71 Dudley St., Dept. 33, Cambridge, MA 02140
Phone/FAX: (617) 864-5567

CIRCLE 862 ON READER SERVICE CARD

VISUALIZE YOUR DATA

MCA+ transforms most marketing and social science data to easily understood perceptual maps. Communicate complex relations with ease using presentation quality charts. Most printers supported. Demos available

Bretton-Clark

89 Headquarters Plaza, Morristown, NJ 07960
(201) 993-3135 FAX: (201) 993-1757

CIRCLE 863 ON READER SERVICE CARD

SURVEYS

The Survey System

Analyzes: marketing, public opinion, customer satisfaction, employee attitude surveys. Handles mail, personal, phone, scanner, disk-by-mail or computer interviews. Records verbatim text & voice answers. Powerful, flexible, user friendly. Free support.

Creative Research Systems

15 Lone Oak Ctr. Dept. P, Petaluma, CA 94952
Ph: (707) 765-1001 Fax: (707) 765-1068

#1 in Surveys - StatPac Gold IV

Professional's choice for survey & marketing research. User-friendly, comprehensive & dependable. Camera ready tables & graphics. Basic & advanced statistics. CRT & telephone interviewing. Easiest to learn. Guaranteed.

StatPac Inc.

3814 Lyndale Ave. S., Mpls., MN 55409
Tel: (612) 822-8252 Fax: (612) 822-1708

CIRCLE 855 ON READER SERVICE CARD

UTILITIES

PEN PLOTTER EMULATOR

FPLOT turns your printer into an HP pen plotter. Fast hi-res, no jagged lines. Vary line width, color. Screen preview - zoom, pan. Works with most CAD programs. Supports most printers. Requires DOS 2.1 or higher. \$119+\$3 S&H. VISA/MC/Chk/MO.

FPLOT Corporation

24-16 Steinway St., Suite 605
Astoria, NY 11103 • 718-545-3505

CIRCLE 856 ON READER SERVICE CARD

FastTrax 4.0 The Best Disk Optimizer

Speeds disk access, reclaims wasted space. Defragments any size DOS disk incl. over 1Gb. No limits on directories, files or clusters. Unique in-cylinder method reduces seeks. MakeTrax (incl.) for custom file placement. \$70+\$5 S&H Visa/MC/Chk/MO.

FastTrax International

880 Ensenada Avenue, Berkeley, CA 94707
24-hr Sales and Tech Support (510) 525-3510

CIRCLE 857 ON READER SERVICE CARD

REMOVE HARDWARE LOCKS

Protect your investment! Maintain Productivity! Software utility that allows for the removal of hardware locks. Available for most CAD/CAM & PCB sw programs. Easy - Simple - Guaranteed Programs start at \$99.00 Call or Fax for info.

SafeSoft Systems Inc.

201 - 1111 Monroe Ave., WPG, Mb, CANADA
R2K 3Z5 (204) 669-4639 Fax: (204) 668-3566

CIRCLE 868 ON READER SERVICE CARD

VOICE/FAX

Multi-Voice (R) / Multi-Fax (R) Tools

Complete "C" development Toolkits. Accesses all features of speech processing boards. Helps write Multi-Line Voice/Fax (CAS) systems in minutes. Examples provided. Source code incl. Dialogic, Rhetorex, Newvoice: \$599; Watson: \$99; Fax: \$199

ITI Logiciel

4165 A St-Denis, Montreal, Quebec, Can. H2W 2M7
Tel: (514) 847-2240 Fax: (514) 847-2242 V/MC

WINDOWS

WINDOWS - LAN-EMAIL- from \$99.95

"While You Were Out!" is MS Windows based, LAN compatible Messaging System. Users on your network may send, receive, save, print, forward & group messages to each other. Ensure timely & accurate messaging. No more pink message slips!

ComputerHelp Resources Inc.

To Order: 800-448-4469 or 800-EGG-HEAD
FAX: 604-244-8360

CIRCLE 860 ON READER SERVICE CARD

Pinpoint PC Bottlenecks

- Personal Measure shows how apps spend time.
- Upgrade or replace PCs based on hard facts.
- Identify network trouble spots.
- Resolve app problems using our services.
- \$125 + S&H (5.25" or 3.5") MC/VISA

SPIRIT OF PERFORMANCE, INC.

73 Westcott Road, Harvard, MA 01451
tel. 508/456-3889, telex 6503571400

CIRCLE 861 ON READER SERVICE CARD

MISCELLANEOUS ACCESSORIES

STOP COMPUTER PAIN NOW!

CompUrest relieves repetitive stress injuries by supporting your forearms and lowering your keyboard. Why stop at your wrist? Go all the way to computer comfort. Available in solid oak, Lucite and Plastic. Meas. 21" X 23"

CompUcube, Inc.

US Pat. Ser. No. 071732, 791
1-800-458-3842 or 212-757-8043

CIRCLE 862 ON READER SERVICE CARD

DISKETTE COPY SERVICES

DUPLICATE DISKS FAST!

DiskDupe copies 2 to 6 times faster than DOS! Reads master once, makes unlimited copies. Stores images on hard disk. Pull-down menus. Automatically formats. 5", 3", high-density. Only \$79. Money Back Guarantee!

MICRO SYSTEM DESIGNS, INC.

10062 Miller Ave. #104, Cupertino, CA 95014
408-446-2066 Fax: 408-446-2095

CIRCLE 865 ON READER SERVICE CARD

INSURANCE

Insurance For Business Computers

Covers desktops, laptops, networks, all software, and even valuable data files. Don't settle for policies designed for home computers or office typewriters if you use your system for business. Low premiums. Call 24 hrs. to receive application.

DATA SECURITY INSURANCE

4800 Riverbend Road, Boulder, CO 80301
1-800-822-0901

ON-LINE SERVICES

HEAT IN THE NIGHT

FREE! FREE! FREE! FREE! FREE! FREE! FREE! FREE!
THE HOTTEST AND ONLY
FREE BBS in the country.
It's where erotic couples & singles meet.
XXX CHAT

ALWAYS FREE - NEVER A CHARGE!

1-515-FUNN-BBS

The Business BBS

Enterlink has all features of a regular bbs & all the features any professional is looking for: Credit Reports, CNN, AP, UPI, USA Today Real Estate, Telecommunications Sports, Stock Info, Investing, Nasa News, 100000 Shareware Files, Live Chat.

Enterlink Technology

(619) 951-3773 voice 24 hours
(714) 383-3140 14.4 V. 32 bis (713) 783-4380

CIRCLE 866 ON READER SERVICE CARD

THE MODEM DEPOT

Now you can buy, rent, sell or trade your modem 24 hrs/day 7 days/wk for free! No minute or hourly charge. Call the 800# with your modem & get all new information on modems and modem software. Rent any modem today with no credit checks.

ENTERLINK TECHNOLOGY

Attn: The Modem Depot
(800) 669-6934 14.4 V.32bis Voice 619-951-3773

CIRCLE 867 ON READER SERVICE CARD

SERVICES

FOR HIRE - TYPIST - 1,800 WPM

- Why type when we can SCAN it?
- Fast, Accurate, Inexpensive. Overnite Svc Avail
- Any text-docs, financials, lists, mnscrip. etc.
- Converted to diskette file for any PC or Mac program—spreadsheet, word processor, database

ScanType

6557 Via Barona, Carlsbad, CA 92009
(800) 597-SCAN In CALIF: (800) 300-SCAN

CIRCLE 868 ON READER SERVICE CARD

Your Success Is In The Cards...

In the PC Magazine Marketplace BusinessCard pages. Advertise in every issue—pay less and increase impact.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

CIRCLE 869 ON READER SERVICE CARD



Advertising Sales Staff

One Park Avenue,
New York, NY 10016
212 503-5100

DISPLAY ADVERTISING

Dan Rosensweig -
Associate Publisher
(212) 503-5354

Anna Zornosa - Associate
Publisher/West Coast
(415) 378-5505

Robert Diftler - Central
Advertising Manager
(312) 346-7666

Lon Otremba -
East Coast
Advertising Director
(212) 503-4453

Sales Manager
Michael Hatherill
(212) 503-5128

Ad Systems Supervisor
Christine Holsten
(212) 503-5264

Advertising Coordinator
Julie Eigo
(212) 503-5107

MA, NH, VT, ME, RI

District Sales Manager
Kimberly Rene White
10 President's Landing, Mystic
Central
Medford, MA 02155
(617) 393-3055

Account Representative
Ira Becker
(212) 503-5132

CT, NY, NJ, PA

District Sales Manager
Michael Bird
One Park Avenue, 4th Floor
New York, NY 10016
(212) 503-5307

District Sales Manager
Lisa Friedman
(212) 503-5149

Account Representatives
Andrew Jacobs
(212) 503-5130
Adam Power
(212) 503-5663

DE, MD, DC, VA, WV, NC, SC, AL,
MS, TN, AR, KY, GA, FL

3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 239-9780

Account Representative
Allyson Deane
(212) 503-5044

NE, WI, IL, IN, KS, MN, MO, OH,
MI, IA, ND, SD, Canada

District Sales Manager
Stephen Dress
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 346-7666

District Sales Manager
Jay Overbye
(312) 346-7666

Sr. Account Representative
Beth Boyle
(212) 503-5047

Account Representative
Maureen Dooley
(212) 503-5126

TX, OK, LA, NM

District Sales Manager
Paul Klein
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 360-5725

Sr. Account Representative
Stephanie Brzozowski
(212) 503-5675

CA (San Diego & Orange County),
AZ, NV, HI

District Sales Manager
David Lynn (714) 852-5924
18500 Von Karman Avenue, Suite 510
Irvine, CA 92715
(714) 852-5914

District Sales Manager
Robin Kofsky
(714) 852-5920

Sr. Account Representative
Molly Shank
(212) 503-5113

CA (Los Angeles)

District Sales Manager
Mary Arlotto (213) 351-1811
3530 Wilshire Boulevard, Suite 645
Los Angeles, CA 90010
(213) 351-1810

Account Representative
Elizabeth O'Connor
(212) 503-5040

CA (San Jose)

District Sales Manager
Michael Klein (415) 378-5521
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

Sr. Account Representative
Kathy Kottenbach
(212) 503-5041

Mike Kisseberth - Northwest
Advertising Manager
(415) 378-5510

CA (San Francisco & North), ID,
OR, WA

District Sales Representative
Todd Anderman (415) 378-5527
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520

District Sales Representative
Rick Vandervoorn
(415) 378-5523

Account Representative
Mike Medwig
(212) 503-5129

CA (South San Francisco to
Mountainview), CO, UT, WY, AK

District Sales Manager
Phylliss Egan
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-6859

Sr. Account Representative
Kathy Kottenbach
(212) 503-5041

Account Development Specialist
Ronni Reiburn
(212) 503-5104

For more information
regarding *display*
advertising please call:
212 503-5100
1-800-33MAG AD

CENTRAL ADVERTISING

VP, Central Advertising
Paul Stafford

Sales Manager
Monte Wasch

Production Director
Anne Brockinton

Sr. Production Coordinator
Mary C. Murawinski

Production Coordinators
Berhan Asmarom
Nadine Messier

CA (415, 408)

Account Representative
Michael Alexander
(212) 503-5118

CA (209, 510, 707, 714, 805, 916), CN,
Overseas

Account Representative
Tim Castelli
(212) 503-5125

AL, FL, GA, KY, MS, NC, SC, TN, VA,
WV

Account Representative
Leslie Eddy
(212) 503-5171

CT, MA, ME, NH, NJ, RI, VT

Account Representative
Bill Herbst
(212) 503-5193

DC, DE, MD, NY, OH, PA

Account Representative
Elizabeth Osias
(212) 503-5167

CO, ID, MT, NV, OR, UT, WA, WY

Account Representative
Caroline Padron
(212) 503-5156

CA (213, 310, 818), HI

Account Representative
Claudia Porfilio
(212) 503-5184

AK, AR, AZ, CA (619), LA, NM, OK, TX

Account Representative
Stuart Zura
(212) 503-5117

IA, IL, IN, KS, MI, MN, MO, ND, NE,
SD, WI

(212) 503-5115

Business Card Account
Representative
Tim Stanton (212) 503-5175
PC Magazine Marketplace
3rd Floor, One Park Ave.
New York, NY 10016

For more information
regarding *central*
advertising please call:
212 508-5115
1-800-825-4237

Advertisers' Index COMPANIES

Reader Service No.	Advertiser	Page
293	3 Com Corp	272-273
167	3M Data Storage Products	100
360	Acma Computers	393
096	AddStor	233
*	Apple Computers	151-154
016	Approach Software Corp	309
209	Ariel Design Inc	402
336	Arlington Computer Products	416
254	Artisoft Inc	267
008	ASP Computer Products	88
228	ATI Technologies Inc	76
099	Aurum Computers	207
012	Austin Computer Systems	13-15
287	Borland International	52-53
328	Buffalo Products	436
015	Bulldog Computer Products	434
028	Calcomp	55
190	CallSoft	80
388	CallSoft	83
*	Chipsoft Inc	177
026	Colorado Memory Systems	36
308	Compaq Computer	96-97
128	CompuAdd Express	367-370
126	CompuAdd	62-63
205	Compuclassics	417
357	CompuDyne	33-35
132	CompuDyne	288-289
144	CompUSA	437
300	Computability	407
348	Computer Associates	2-3
381	Computer Associates	5
106	Computer Discount Warehouse	410-413
177	Computer Express	430
009	Computer Library	365
158	Computer Library	371
033	Computer Library	406
105	Computer Peripherals Inc	4
316	Comtrade	375
011	Corel Corporation	104
*	Dell Computer Corporation	C5-C8
*	Dell Computer Corporation	108-109
*	Dell Computer Corporation	168-169
*	Dell Computer Corporation	280-281
*	Dell Computer Corporation	314-315
250	Delrina Technology	43
*	Digital Equipment Corporation	261-263
002	Digital Products Inc	271
243	Dustin Discount Software	47
168	Dustin Discount Software	346
347	Dustin Discount Software	354-355

Reader Service No.	Advertiser	Page
119	Edge Technology	396-397
197	EPS Technology	376-377
*	Epson America	68-69
*	Epson America	123
305	Expo Tech	394-395
032	FASTMICRO	359-364
352	FASTMICRO	414-415
*	First Source International	426-427
*	Gateway 2000	162-163
*	Gateway 2000	48a-h
014	Grid On-Line Express	385
391	H.Co Memory Upgrades	435
*	Hard Drives International	352-353
102	Hunter Computer	425
*	Hyundai Electronics	237-244
275	Hyundai Electronics	400-401
*	IBM Corporation	67
052	IBM Corporation	78-79
024	IBM Corporation	285
*	Insight Distribution Network	348-351
106	Kingston Technology	235
*	Kyocera	147
370	Kyocera	149
019	L.A. Trade	432
169	Landmark	409
237	Lasermaster	94
*	Lotus Development Corporation	72-73
*	Lotus Development Corporation	74-75
*	Lotus Development Corporation	106-107
263	Macola, Inc	156
067	Mag Innovision	41
050	Mathsoft Inc	269
005	Micro Solutions Computer Products	174
023	Microcom	58
311	Micrografx	57
*	Microsoft	16-17
*	Microsoft	C2-C4,p1
*	Microsoft	116-121
*	Microsoft	137-139
*	Microsoft	140-141
*	Microsoft	143
*	Microsoft	145
*	Microsoft	203
013	Microtac Software	65
225	MicroWarehouse	195-196
010	Midwest Computer Works	424
112	Mitac (AGAtch)	404-405
*	National Semi Conductor	70
394	NEC Technologies	26-27
217	NEC Technologies	98

Reader Service No.	Advertiser	Page
*	Northgate Computer Systems	102-103
*	Northgate Computer Systems	304-305
155	Occidental, Inc	295-298
056	Okidata	253
215	Olympic Computer Systems	403
*	Pacific Data Products, Inc	6
145	Pacific Wave Technology	433
*	PC Brand	185-188
*	PC Connection	224-229
080	Pc Power & Cooling	23
199	PC Zones	422-423
092	PCs Compleat	418-419
268	PCs Compleat	420-421
324	Peripheral Express	431
148	Primavera Systems	45
*	Quill Corporation	381-383
290	Rose Electronics	265
296	SAMTRON	18
257	Santron Computer	372-373
006	ShapeWare	274
213	Sigma Data	307
212	SoftMaker	84-85
071	Sony Computer Peripheral	10-11
061	Stac Electronics	126-127
057	StatSoft	61
279	SyDOS	101
186	Symantec Corporation	28
264	Symantec Corporation	205
045	Tangent Computer, Inc	356
001	Tektronix Inc	157
206	TELEMART	428-429
353	Texas Instruments	86
379	Toshiba America	20-21
021	Touchstone Software	82
121	Tri-Star Computers	398
020	US Systems & Technologies	378-380
189	USA Flex	386-387
051	USA Flex	388-389
210	USA Flex	390-391
211	Xircom	248
*	Zenith Data Systems	213-220
063	Zeos Int'l	24-25
038	Zeos Int'l	89
125	Zeos Int'l	90-91
036	Zeos Int'l	92
151	Zeos Int'l	129-134
115/035	Zeos Int'l	135
354	Ziff Desktop Information	438
* No Reader Service #. Please Call Advertiser For Information.		

Advertisers' Index PRODUCTS

Reader Service No.

Company	Product	Page
ACCOUNTING SOFTWARE		
Dustin Discount Software	DacEasy Accounting	47
Macola, Inc.	Accounting Software	158
ADD-ON BOARDS		
Lasermaster	Win Print Products	94
Sigma Data	Workstations	307
APPLE PRODUCTS		
Apple Computers	MAC's	151-154
ARTIFICIAL INTELLIGENCE		
Computer Associates	CA-Clipper	2-3
BACKUP SOFTWARE		
Corel Corporation	Corel SCSI	104
CD-ROM		
Computability	Mail Order	407
Computer Library	Computer Select	371
Dustin Discount Software	CD-ROM Products	346
Micro Solutions Computer Products	CD-ROM	174
Peripheral Express	Hardware/Peripherals	431
Sony Computer Peripheral	CD-ROM	10-11
CO-PROCESSORS		
Sigma Data	Math Co-processors	307
COMMUNICATIONS SOFTWARE		
Macola, Inc.	Networking Software	158
Microsoft	Sparta Work Group	140-141
COMPUTERS/COMPATIBLES		
Acme Computers	Acme PC's	393
Anel Design Inc.	Computers	402
Aurum Computers	Notebook Computers	207
Austin Computer Systems	Austin Desktops	13-15
Bulldog Computer Products	Compatibles	434
Compaq Computer	ProSigna Servers	96-97
CompuAdd	CompuAdd Systems	62-63
CompuAdd Express	CompuAdd Express Systems	367-370
CompuDyne	CompuDyne Desktop	33-35
Comtrade	Systems	375
Dell Computer Corporation	Dell Systems	C5-C8
Dell Computer Corporation	Dell Systems	108-109
Dell Computer Corporation	Dell Systems	168-169
Dell Computer Corporation	Dell Systems	280-281
Dell Computer Corporation	Dell Systems	314-315
Digital Equipment Corporation	Systems	-1
Edge Technology	Edge Technology PC's	396-397
EPS Technology	PC's	376-377
Epson America	Wingate PC's	123
Expo Tech	PC's	394-395
FASTMICRO	Systems	359-364
Gateway 2000	Notebooks, Mail Order	162-163
Gateway 2000	PC's	48a-h
Grid On-Line Express	Grid Desktops	385
Hard Drives International	PC's	352-353
Hunter Computer	Systems	425
Hyundai Electronics	386 PC's, 486 PC's	237-244
Hyundai Electronics	386 PC's, 486 PC's	400-401
IBM Corporation	PS/2 Desktops	78-79
Insight Distribution Network	Systems	348-351
Midwest Computer Works	PC's	424
Mitac (AGAtach)	Mitac PC's	404-405
NEC Technologies	Select Solutions	26-27
Northgate Computer Systems	PC's	102-103
Northgate Computer Systems	PC's	304-305
Occidental, Inc.	486DX2-66, DX2-50, 486SX-25, DX-3	295-298
Olympic Computer Systems	Olympic Computer Systems	403
Pacific Wave Technology	Hardware Reseller	433
PC Brand	Mail Order PC's	185-186
PC Brand	Mail Order PC's	185-186
PC Zones	Mail Order	422-423
PCa Complet	Computers, Reseller, Mail Order	418-419
PCa Complet	Computers/Compatibles	420-421
Quill Corporation	PC's, Notebooks, Mail Order	381-383
Santrom Computer	486's, PC's, Notebooks	372-373
Tangent Computer, Inc.	PC's	356
Tri-Star Computers	Systems, Mail Order	398
USA Flex	USA Flex Systems	386-387
USA Flex	Compatibles	388-389
Zenith Data Systems	Notebooks, PC's, Mail Order	213-220
Zeos Int'l	Zeos 486 EISA	24-25
Zeos Int'l	Zeos Color Notebooks	89
Zeos Int'l	Zeos Freestyle SL Notebook	90-91
Zeos Int'l	Zeos Pocket PC	92
Zeos Int'l	Zeos Upgradables	129-134
Zeos Int'l	Z-Card / Z Quote	135
DATA BASE MANAGERS		
Approach Software Corp.	Approach 2.0 for Windows	309
Microsoft	Access/Fox Pro 2.5	116-121
DATA COMPRESSION SOFTWARE		
AddStor	SuperStor	233
Stac Electronics	Stacker	126-127
DISK BACKUP & TAPE DRIVES		
3M Data Storage Products	Data Storage Products	100
Arlington Computer Products	Mail Order	416
Colorado Memory Systems	Jumbo 250 Tracker	38
Micro Solutions Computer Products	Tape Backup, Disk Drives	174
DISKETTES		
3M Data Storage Products	Data Storage Products	100
DISPLAYS/MONITORS/TERMINALS		
Mag Innovation	High Resolution Monitors	41
Midwest Computer Works	Monitors	424

Reader Service No.

Company	Product	Page
NEC Technologies	Select Solutions	26-27
Peripheral Express	Hardware/Peripherals	431
SAMTRON	Monitors	18
USA Flex	Peripherals	390-391
EDUCATIONAL SOFTWARE		
Ziff Desktop Information	Educational Software	438
ELECTRONIC MAIL		
CallSoft	cc Mail	83
EMULATORS/PROTOCOL CONVERTERS		
Pacific Data Products, Inc.	Pacific Page PE/XL	6
ENTERTAINMENT SOFTWARE		
Ziff Desktop Information	Games Software	438
FONT CARTRIDGES		
Digital Products Inc.	Netsprint	271
Pacific Data Products, Inc.	Pacific Page PE/XL	6
FONT SOFTWARE		
Microsoft	Win Font Pak	143
SoftMaker	Font Software	84-85
FOREIGN SOFTWARE		
Microtac Software	Foreign Language Software	65
FORM DESIGNERS		
Delina Technology	PerFORM Pro Plus	43
GRAPHICS SOFTWARE		
Micrograph	Windows Draw/Designer	57
ShapeWare	Visio	274
HAND-HELD PC'S		
Zeos Int'l	Zeos Pocket PC	92
HARD DISKS		
SyDOS	Removable Cartridge Drive	101
HARDWARE		
FASTMICRO	Hardware	414-415
Insight Distribution Network	Hardware	348-351
Pacific Wave Technology	Hardware Reseller	433
HIGH RESOLUTION PRINTER BOARDS		
Lasermaster	Win Print Products	94
INPUT DEVICES		
Microsoft	Ballpoint for Windows	203
INTEGRATED SOFTWARE		
Lotus Development Corporation	Smart Suite	72-73
LANGUAGES		
Computer Associates	CA-Clipper	2-3
Computer Associates	CA-Resizer	5
LOCAL AREA NETWORKING		
3 Com Corp.	Token Link III Adapter Board	272-273
Artisoft Inc.	LANtastic	257
ASP Computer Products	Server Jet...	86
Bulldog Computer Products	Networking	434
Compaq Computer	ProSigna Servers	96-97
Computability	Mail Order	407
Computer Discount Warehouse	Networking, Peripherals	410-413
Computer Library	Support On Site for Networks	406
Digital Products Inc.	Netsprint	271
Northgate Computer Systems	Networking	102-103
Northgate Computer Systems	Networking	304-305
Peripheral Express	Hardware/Peripherals	431
Rose Electronics	MicroServ LAN Printer Adapter	265
Tangent Computer, Inc.	LAN	356
Xircom	Pocket Printer Server	248
Zenith Data Systems	Notebooks, PC's, Mail Order	213-220
MAIL ORDER		
Acme Computers	Acme PC's	393
Anel Design Inc.	Mail Order	402
Arlington Computer Products	Mail Order	416
Austin Computer Systems	Austin Desktops & Notebooks	13-15
Bulldog Computer Products	Mail Order	434
Calcomp	Calcomp CCL 600 Laser	56
CallSoft	Mail Order, Software	80
CallSoft	cc Mail	83
CompuAdd	CompuAdd Systems	62-63
CompuAdd Express	CompuAdd Express Systems	367-370
CompuClassics	Mail Order Products	417
CompuDyne	CompuDyne Desktop	33-35
CompuDyne	CompuDyne Notebooks	288-289
Computability	Mail Order	407
Computer Express	Mail Order	430
Comtrade	Mail Order	375
Dell Computer Corporation	Dell Systems	C5-C8
Dell Computer Corporation	Dell Systems	108-109
Dell Computer Corporation	Dell Systems	168-169
Dell Computer Corporation	Dell Systems	280-281
Dell Computer Corporation	Dell Systems	314-315
Digital Equipment Corporation	Systems	-1
Dustin Discount Software	DacEasy Accounting	47
Dustin Discount Software	CD-ROM Products	346
Dustin Discount Software	Mail Order Products	354-355
Edge Technology	Edge Technology PC's	396-397
EPS Technology	Mail Order	376-377
Expo Tech	Mail Order	394-395
FASTMICRO	Mail Order	359-364
First Source International	Mail Order	426-427
Gateway 2000	Mail Order	162-163
Gateway 2000	Mail Order	48a-h

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
014	Grid On-Line Express	Grid Convertible & Desktops	385
391	H Co Memory Upgrades	Mail Order	435
•	Hard Drives International	Mail Order	352-353
102	Hunter Computer	Mail Order	425
•	Hyundai Electronics	386 PC's, 486 PC's	237-244
275	Hyundai Electronics	386 PC's, 486 PC's	400-401
•	Insight Distribution Network	Mail Order	348-351
019	L.A. Trade	Mail Order	432
169	Landmark	PC Diagnostics	409
225	MicroWarehouse	Mail Order	195-196
010	Midwest Computer Works	Mail Order	424
112	Mitac (AGAtch)	Mitac PC's	404-405
394	NEC Technologies	Select Solutions	26-27
•	Northgate Computer Systems	Mail Order	102-103
•	Northgate Computer Systems	Mail Order	304-305
155	Occidental, Inc.	486DX2-66,DX2-50,486SX-25,DX-3	295-298
215	Olympic Computer Systems	Olympic Computer Systems	403
145	Pacific Wave Technology	Mail Order	433
029	PC Brand	Mail Order PC's	185-188
•	PC Connection	Mail Order	224-229
•	PC Connection	Mail Order	224-229
•	PC Connection	Mail Order	224-229
199	PC Zones	Mail Order	422-423
082	PCs Complete	Computers, Reseller, Mail Order	418-419
268	PCs Complete	Computers/Composables	420-421
324	Peripheral Express	Hardware/Peripherals	431
•	Quill Corporation	PC's, Notebooks, Mail Order	381-383
257	Santron Computer	486's, PC's, Notebooks	372-373
045	Tangent Computer, Inc.	Mail Order	356
121	Tri-Star Computers	Systems, Mail Order	398
020	US Systems & Technologies	Notebooks	378-380
189	USA Flex	USA Flex Systems	386-387
051	USA Flex	Composables	388-389
210	USA Flex	Peripherals	390-391
•	Zenith Data Systems	Notebooks, PC's, Mail Order	213-220
063	Zeos Int'l	Zeos 486 EISA	24-25
038	Zeos Int'l	Zeos Color Notebooks	89
125	Zeos Int'l	Zeos Freestyle SL Notebook	90-91
036	Zeos Int'l	Zeos Pocket PC	92
151	Zeos Int'l	Zeos Upgradables	129-134
115/035	Zeos Int'l	Z-Card / Z-Quote	135

MAINTENANCE

169	Landmark	PC Diagnostics	409
-----	----------	----------------	-----

MASS STORAGE

011	Corel Corporation	Corel SCSI	104
279	SyDOS	Removable Cartridge Drive	101

MEMORY

•	First Source International	Memory	428-427
391	H Co Memory Upgrades	Memory	435
106	Kingston Technology	Memory	235
019	L.A. Trade	Memory	432
213	Sigma Data	Memory Upgrades	307

MISCELLANEOUS

•	IBM Corporation	OS/2 Technical Interchange	67
005	Micro Solutions Computer Products	Tape Backup, Disk Drives, CD-ROM	174
•	Microsoft	Video for Windows	16-17
•	Microsoft	Ready to Run Windows OEM	145
354	Ziff Desktop Information	Business/Home Software	438

MODEMS

336	Arlington Computer Products	Mail Order	416
300	Computability	Mail Order	407
105	Computer Peripherals Inc.	14.4 Fax Modem	4
•	National Semi Conductor	Tylin 2000	70
210	USA Flex	Peripherals	390-391

MULTI-MEDIA

190	CallSoft	Mail Order, Software	80
011	Corel Corporation	Corel SCSI	104
•	Quill Corporation	PC's, Notebooks, Mail Order	381-383

MULTIFUNCTION BOARDS

•	National Semi Conductor	Tylin 2000	70
---	-------------------------	------------	----

ON LINE DATABASE

009	Computer Library	SupportOnSite for Applications	365
033	Computer Library	Support On Site for Networks	406

OPERATING SYSTEMS/ENVIRONMENTS

•	IBM Corporation	OS/2 Technical Interchange	67
•	Microsoft	Windows 3.1	137-138

OPTICAL PERIPHERALS

011	Corel Corporation	Corel SCSI	104
198	PC Zones	Mail Order	422-423

OS/2 SOFTWARE

024	IBM Corporation	IBM CS&Z	285
311	Micrograph	Windows Draw/Designer	57

PC ACCESSORIES

005	Micro Solutions Computer Products	Tape Backup, Disk Drives, CD-ROM	174
-----	-----------------------------------	----------------------------------	-----

PC DIRECT

360	Acme Computers	Acme PC's	393
209	Anel Design Inc.	Computers, Mail Order	402
336	Arlington Computer Products	Mail Order	416
328	Buffalo Products	Logical Printer Sharing	436
015	Bulldog Computer Products	Composables, Mail Order	434
128	CompuAdd Express	CompuAdd Express Systems	367-370
205	Compuclassics	Mail Order Products	417
144	CompUSA	CompCARE Technique	437
300	Computability	Mail Order	407
106	Computer Discount Warehouse	Mail Order	410-413
177	Computer Express	Mail Order, Software	430

Reader Service

No.	Company	Product	Page
318	Comtrade	Mail Order, Systems	375
168	Dustin Discount Software	CD-ROM Products	348
347	Dustin Discount Software	Mail Order Products	354-355
119	Edge Technology	Edge Technology PC's	396-397
197	EPS Technology	Notebooks, PC's, Mail Order	376-377
305	Expo Tech	PC's, Notebooks, Mail Order	394-395
032	FASTMICRO	Mail Order, Systems	359-364
352	FASTMICRO	Mail Order	414-415
•	First Source International	Memory, Mail Order	428-427
014	Grid On-Line Express	Grid Convertible & Desktops	385
391	H Co Memory Upgrades	Mail Order, Memory	435
•	Hard Drives International	Hard Drives, Mail Order, PC's	352-353
102	Hunter Computer	Systems, Mail Order	425
•	Insight Distribution Network	Systems, Hardware, Mail Order	348-351
019	L.A. Trade	Mail Order, Memory	432
169	Landmark	PC Diagnostics	409
010	Midwest Computer Works	Mail Order	424
112	Mitac (AGAtch)	Mitac PC's	404-405
215	Olympic Computer Systems	Olympic Computer Systems	403
145	Pacific Wave Technology	Mail Order	433
199	PC Zones	Mail Order	422-423
082	PCs Complete	Computers, Reseller, Mail Order	418-419
268	PCs Complete	Computers, Reseller, Mail Order	420-421
324	Peripheral Express	Hardware/Peripherals	431
•	Quill Corporation	PC's, Notebooks, Mail Order	381-383
257	Santron Computer	486's, PC's, Notebooks	372-373
045	Tangent Computer, Inc.	Mail Order	356
208	TELEMART	Software, Resellers	428-429
121	Tri-Star Computers	Systems, Mail Order	398
020	US Systems & Technologies	Notebooks	378-380
189	USA Flex	USA Flex Systems	386-387
051	USA Flex	Composables	388-389
210	USA Flex	Peripherals	390-391
•	Zenith Data Systems	Notebooks, PC's, Mail Order	213-220

PC-FAX

105	Computer Peripherals Inc.	14.4 Fax Modem	4
•	National Semi Conductor	Tylin 2000	70

PERIPHERAL SHARING DEVICE

008	ASP Computer Products	Server Jet	88
328	Buffalo Products	Logical Printer Sharing	436
002	Digital Products Inc.	Netsprint	271

PERIPHERALS

328	Buffalo Products	Logical Printer Sharing	436
-----	------------------	-------------------------	-----

PLOTTERS/CHARTING DEVICES

•	Pacific Data Products, Inc.	ProTracer	6
---	-----------------------------	-----------	---

PORTABLE/LAP COMPUTERS

099	Aurum Computers	Notebook Computers	207
012	Austin Computer Systems	Austin Notebooks	13-15
126	CompuAdd	CompuAdd Systems	62-63
128	CompuAdd Express	CompuAdd Express Systems	367-370
132	CompuDyne	CompuDyne Notebooks	288-289
106	Computer Discount Warehouse	Laptops	410-413
•	Dell Computer Corporation	Dell Systems	CS-CB
•	Dell Computer Corporation	Dell Systems	108-109
•	Dell Computer Corporation	Dell Systems	168-169
•	Dell Computer Corporation	Dell Systems	280-281
•	Dell Computer Corporation	Dell Systems	314-315
•	Digital Equipment Corporation	Systems	-1
119	Edge Technology	Edge Technology PC's	396-397
197	EPS Technology	Notebooks	376-377
•	Epson America	Wingene PC's	123
305	Expo Tech	Notebooks	394-395
•	Gateway 2000	Notebooks	162-163
•	Gateway 2000	Notebooks	486-h
014	Grid On-Line Express	Grid Convertible	385
•	Northgate Computer Systems	Notebooks	102-103
•	Northgate Computer Systems	Notebooks	304-305
215	Olympic Computer Systems	Olympic Computer Systems	403
199	PC Zones	Mail Order	422-423
•	Quill Corporation	PC's, Notebooks, Mail Order	381-383
257	Santron Computer	486's, PC's, Notebooks	372-373
379	Toshiba America	Notebooks, PC's	20-21
020	US Systems & Technologies	Notebooks	378-380
189	USA Flex	USA Flex Systems	386-387
051	USA Flex	Composables	388-389
•	Zenith Data Systems	Notebooks, PC's, Mail Order	213-220
038	Zeos Int'l	Zeos Color Notebooks	89
125	Zeos Int'l	Zeos Freestyle SL Notebook	90-91
036	Zeos Int'l	Zeos Pocket PC	92

POWER PROTECTION

080	Pc Power & Cooling	Power Supplies	23
-----	--------------------	----------------	----

PRE-PRINTED FORM SOFTWARE

•	Microsoft	Sparta Work Group	140-141
---	-----------	-------------------	---------

PRESENTATION SOFTWARE

311	Micrograph	Windows Draw/Designer	57
-----	------------	-----------------------	----

PRINTER ACCESSORIES

008	ASP Computer Products	Server Jet	88
237	Lasermaster	Win Print Products	94
005	Micro Solutions Computer Products	Tape Backup, Disk Drives, CD-ROM	174
056	Olidata	LED Page Printer	253
211	Xircom	Pocket Printer Server	248

PRINTERS

336	Arlington Computer Products	Mail Order	416
008	ASP Computer Products	Server Jet	88
328	Buffalo Products	Logical Printer Sharing	436
028	Calcomp	Calcomp CCL 600 Laser	55
002	Digital Products Inc.	Netsprint	271
•	Kyocera	FS 1500A Printer	147
370	Kyocera	FS 1500A Printer	149
237	Lasermaster	Win Print Products	94
217	NEC Technologies	Slantwriter Laser Printer	96

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
058	Obdette	LED Page Printer	253
*	Pacific Data Products, Inc.	ProTracer	6
324	Peripheral Express	Hardware/Peripherals	431
001	Tektronix Inc.	Color Printers	157
353	Texas Instruments	TI Micro Laser Printers	86
210	USA Flex	Peripherals	390-391

PROGRAM DEVELOPERS/GENERATORS

361	Computer Associates	CA-Realizer	5
024	IBM Corporation	IBM CSev2	285

PROGRAMMERS TOOLS UTILITIES

340	Computer Associates	CA-Clipper	2-3
361	Computer Associates	CA-Realizer	5
024	IBM Corporation	IBM CSev2	285

PROJECT MANAGEMENT

148	Primavera Systems	Project Management	45
-----	-------------------	--------------------	----

REMOTE COMPUTING

023	Microcom	Carbon Copy for Windows	58
-----	----------	-------------------------	----

RESELLERS

205	Compuclassics	Mail Order Products	417
106	Computer Discount Warehouse	Reseller	410-413
243	Dustin Discount Software	DeeEasy Accounting	47
168	Dustin Discount Software	CD-ROM Products	346
352	FASTMICRO	Reseller	414-415
010	Midwest Computer Works	Reseller	424
206	TELEMART	Software, Resellers	428-429

SCANNERS/DIGITIZERS

*	Epson America	Scanners	66-69
---	---------------	----------	-------

SERVERS

308	Compaq Computer	ProSignia Servers	96-97
045	Tangent Computer, Inc.	Servers	358

SERVICE/SUPPORT

144	CompUSA	CompCARE Techline	437
*	Microsoft	Ready to Run Windows OEM	145

SOFTWARE

190	CallSoft	Mail Order, Software	80
300	Computability	Mail Order	407
177	Computer Express	Software	430
352	FASTMICRO	Software	414-415
394	NEC Technologies	Select Solutions	26-27
145	Pacific Wave Technology	Software Reseller	433
206	TELEMART	Software, Resellers	428-429

SPREADSHEET/TEMPLATES

267	Borland International	Quattro Pro for Windows	52-53
190	CallSoft	Mail Order, Software	80
*	Lotus Development Corporation	Lotus 1-2-3 for Windows	74-75
*	Lotus Development Corporation	Lotus 1-2-3 for DOS	106-107

STATISTICAL SOFTWARE

050	Mathsoft Inc.	Mathcad 3.1	269
057	StatSoft	Statistical Software	61

TAX SOFTWARE

*	Chipsort Inc.	Turbo Tax Software	177
---	---------------	--------------------	-----

TRAINING/SEMINARS/CONFERENCES

*	IBM Corporation	OS/2 Technical Interchange	67
---	-----------------	----------------------------	----

UTILITIES

186	Symantec Corporation	Norton Desktop for Windows	28
284	Symantec Corporation	Norton Utilities	205
021	Touchstone Software	Check It Plus	82
354	Ziff Desktop Information	Utilities Software	438

VERTICAL MARKET SOFTWARE

050	Mathsoft Inc.	Mathcad 3.1	269
057	StatSoft	Statistical Software	61

VIDEO GRAPHICS/BOARDS

336	Arlington Computer Products	Mail Order	418
228	ATI Technologies Inc.	ATI Graphics Accelerators	78
210	USA Flex	Peripherals	390-391

WINDOWS SOFTWARE

016	Approach Software Corp.	Approach 2.0 for Windows	309
267	Borland International	Quattro Pro for Windows	52-53
190	CallSoft	Mail Order, Software	80
368	CallSoft	cc-Mail	83
*	Lotus Development Corporation	Smart Suite	72-73
*	Lotus Development Corporation	Lotus 1-2-3 for Windows	74-75
263	Macola, Inc.	Accounting/Networking Software	156
050	Mathsoft Inc.	Mathcad 3.1	269
023	Microcom	Carbon Copy for Windows	58
311	Micrograph	Windows Draw/Designer	57
*	Microsoft	Video for Windows	16-17
*	Microsoft	Word for Windows	C2-C4,p1
*	Microsoft	Access/Fox Pro 2.5	118-121
*	Microsoft	Windows 3.1	137-138
*	Microsoft	Sports Work Group	140-141
*	Microsoft	Win Font Pak	143
*	Microsoft	Ready to Run Windows OEM	145
*	Microsoft	Ballpoint for Windows	203
057	StatSoft	Statistical Software	61
186	Symantec Corporation	Norton Desktop for Windows	28
354	Ziff Desktop Information	Windows Software	438

WORD PROCESSING SOFTWARE/AIDS

190	CallSoft	Mail Order, Software	80
*	Microsoft	Word for Windows	C2-C4,p1
354	Ziff Desktop Information	Word Processing Software	438

WORKSTATIONS

*	Quill Corporation	PC's, Notebooks, Mail Order	361-383
---	-------------------	-----------------------------	---------

For Additional Categories See MARKETPLACE PRODUCT INDEX Page 438



Coming Up

Add-In Software

Thousands of add-ins have been created to enhance spreadsheets and word processors. *PC Magazine's* editors give detailed impressions of 48 of them and list nearly 100 others. These products bring added capabilities to Lotus 1-2-3, Microsoft Excel, and Quattro Pro as well as to Ami Pro, Microsoft Word, and WordPerfect. Their functionality ranges from finance to project management, font handling to envelope formatting.

How Do You Rate Your PC Vendor?

Our latest survey on service and reliability issues focuses on personal computers. We polled 17,000 of our readers on the reliability of the desktop and laptop machines they had purchased, and asked them to rate the quality of service and technical support that the vendors had provided. We analyze the survey responses and evaluate the companies to help you in your buying decisions.

Ethernet Adapters

Think fast. What's the cheapest and easiest way to connect PCs to your network? With Ethernet LAN adapters, of course. Fast and inexpensive (\$300 to \$400 less than Token-Ring), Ethernet still dominates the market. To find the best 10BaseT adapter, PC Magazine Labs rounded up the fastest and the cheapest ISA Ethernet LAN adapter cards and the most powerful EISA cards, and put them to the test on client PCs and file servers. We report the results.

High-end Desktop Publishing

Accompanied by a lot of fuss and fanfare, QuarkXPress and FrameMaker have finally made it over to the PC. Was it worth the wait? We pit the two newcomers against the capable incumbents, Aldus PageMaker 4.0 and Ventura Publisher 4.1. See how they fare at creating highly designed publications and long documents, as well as their facility at workgroup publishing.

Free Utility

You don't have to be a Windows veteran before you tire of moving your mouse up to the menu bar every time you want to make a selection. If you're finding this process tedious, you'll want to try RCLICK, next issue's utility. RCLICK puts your menus at your fingertips. It's a Windows program that replicates the menu bar for a window and displays it right where your cursor is. You can configure RCLICK to work only with certain programs if you don't want to have this functionality available in all programs. □

Reader Service

No.	Product	Company	Page
AFTER HOURS			
458	Aces of the Pacific	Dynamix Inc.	469
460	Aircraft and Adventure Factory	Mallard Software Inc.	470
462	Flying Fortress	MicroProse Software Inc.	469
461	Falcon 3.0	Spectrum HoloByte	466
461	Operation: Flying Tiger	Spectrum HoloByte	466
468	Rudder Control System	ThrustMaster, Inc.	469

COMPUTERS

506	AcerPower 486e DX2/66	Acer America Corp.	125
	Motile 5657		
509	ALR Flyer 32DT 4DX2/66	Advanced Logic Research Inc.	125
510	American Mitac TL4466	American Mitac Corp.	148
511	American Super Computer 486X2/66	American Super Computer	148
512	Arche Legacy 486/66DX2	Arche Technologies Inc.	150
513	Ares 486-66DX2 VL-Bus	Ares Microdevelopment Inc.	155
514	Ariel 486DX2-66VLB	Ariel Design Inc.	155
515	AST Bravo 4/68d	AST Research Inc.	161
516	ATronics ATI-486-66	ATronics International Inc.	165
517	Austin 486DX2 WinStation	Austin Computer Systems Inc.	171
518	Bi-Link Desktop 486DX2/66	Bi-Link Computer Inc.	173
519	BLK 486DX2/66	Blackship Computer Systems Inc.	175
520	Blue Star 486DX2U	Blue Star Marketing	175
521	BOSS 466d	BOSS Technology Corp.	178
522	Broadax 486DX2-66	Broadax Systems Inc.	178
523	C2 Saber 486e DX2-66	C2 Micro Systems Inc.	178
524	CAF Gold 602	CAF Technology Inc.	178
525	Clover 486 Quick-I Series	Clover Computer Systems Inc.	180
526	Comex 486DX2/66	Comex Computer Corp.	181
527	Compaq Deskpro 66M	Compaq Computer Corp.	181
528	Compaq Systempro/XL	Compaq Computer Corp.	37
529	CompuAdd 466E	CompuAdd Computer Corp.	182
529	CompuAdd Express 486DX2 Scalable	CompuAdd Express	182
530	Contrade 486 EISA Dream Machine	Contrade	183
531	Dell 486DX2/66	Dell Computer Corp.	184
532	DFI 486-66DX2	DFI Inc.	184
533	Diamond DX2-66	Diamond Technologies Inc.	189
534	DECpc 486d LP	Digital Equipment Corp.	189
535	Edge 466 Magnum	Edge Technology Inc.	190
536	EPS ISA 486 DX2/66	EPS Technologies Inc.	191
537	Everex Tempo M Series 486 DX2/66	Everex Systems Inc.	191
538	Expo 486 DX2/66	Expo Tech	192
539	FCS 486-66	First Computer Systems Inc.	192
540	FutureTech System 462E	FutureTech Systems Inc.	193
541	Gateway 2000 4DX2-66V	Gateway 2000	193
542	EasyData 486DX2-2/66	GCH Systems Inc.	194
543	Gecco 486E	Gecco Computers	197
544	HP Vectra 486/66J	Hewlett-Packard Co.	197
545	Hyundai 486DX2	Hyundai Electronics America	198
546	IBM PS/2 Model 77 486DX2	IBM Personal Computer Co.	198
547	Insight 486DX2-66i	Insight Computers	199
463	IDS 4662	International Data Systems	200
464	Blue Max Monolith 486DX2/66UP	Instrumentation Inc.	200
465	486DX2-66 KeyStation	Keydata International Inc.	201
467	Lightning ThunderBox	Lightning Computers	202
466	LodeStar 486-DX2/66 EISA WinStation	LodeStar Computer	201
468	Mega Impact 486DX2/66E+	Mega Computer Systems	202
469	Memorex Telex 6032-66	Memorex Telex Corp.	204
470	ME 486-Local Bus/DX2/66	Micro Express	206
471	Nega Windows Workstation	Nega Systems Corp.	206
472	Flash 486DX2-66E	National Microsystems Inc.	206
473	NCR System 3350	NCR Corp.	206
474	NEC Express DX2/66e	NEC Technologies Inc.	209
475	NETIS Ultra WinStation N466L	NETIS Technology Inc.	210
476	Northgate SlimLine ZXP	Northgate Computer Systems Inc.	210
477	Occidental 65MHz 486DX2	Occidental Systems Inc.	211
478	Oaicom 486 MOD 420	Oaicom Technologies Inc.	211
479	PC Brand Leader Cache 486/DX2-66	PC Brand Inc.	212
480	PC Pros 486/66DX2 5550T	PC Pros/Touche Inc.	221
481	PCS Double Pro-66	Performance Computer Systems Inc.	221

482	Poly 486-58LM	Polywell Computers Inc.	222
483	Klonimus 486DX2/66	QSI Corp.	222
484	Qtech 486 402/66	Quill Corp.	223
429	Sharp 02-9800 Wizard	Sharp Electronics Corp.	42
485	Pylen II 486DX-212	Silicon Valley Computer	130
486	SST 486DX2-66MWC	Sirius Systems Technology Inc.	230
467	Standard Windows Workstation Plus	Standard Computer Corp.	231
486	Swan 486DX2-66DB	Swan Technologies Inc.	232
488	Tangent Model 466ex	Tangent Computer Inc.	232
477	Texas Instruments TravelMate DX250	Texas Instruments	52
480	Tri-Star 66/DX2-VL	Tri-Star Computer Corp.	234
481	Twinhead Supersat 600/462D	Twinhead Corp.	234
483	Jet 486DX2-66	U.S. Micro Express Inc.	245
492	Flex 486DX2/66	USA Flex Inc.	246
494	Wyse Decision 466ei	Wyse Technology	245
401	Z-Lite 320L Model 60	Zenith Data Systems	58
401	Z-Lite 320L Model 60W	Zenith Data Systems	58
495	ZDS Z-Station 486Xh Model 200	Zenith Data Systems	246
496	Zeos 486DX2-66	Zeos International Ltd.	246

DATABASES

505	PRO-dVellBase, Version 2.0	Accelerated Software Corp.	303
498	AceFile 2.0 for Windows	Ace Software Corp.	278
499	Alpha Four, Version 2.1	Alpha Software Corp.	284
500	Approach for Windows, Version 2.0	Approach Software Corp.	286
503	PC-File, Version 8.5	ButtonWare Inc.	293
502	FileMaker Pro 2.0 for Windows	Claris Corp.	292
501	DataEase Express for Windows, Version 1.0	DataEase International Inc.	290
507	Ultra-Plus, Version 2.5	Fairhaven Software Inc.	310
425	Microsoft Access, Version 1.0	Microsoft Corp.	37
497	Survey, Version 2.0	RaoSoft, Inc.	278
504	PrimaBase, Version 3.0	Scandinavian PC Systems Inc.	294
506	D&A, Version 4.0	Symantec Corp.	308

HARDWARE

414	Quicktel 9624LP	Logiccode Technology Inc.	66
407	AirLink	Selectek Corp.	60
434	SunDisk PCMCIA storage	SunDisk	46
433	VideoSpigot for Windows	SuperMac Technology Inc.	50
408	TXM-3401A4	Toshiba America Information Systems Inc.	64
408	TXM-3401E	Toshiba America Information Systems Inc.	64
408	TXM-3401P	Toshiba America Information Systems Inc.	64
409	XM-3401B	Toshiba America Information Systems Inc.	64
435	WorldPort 2400 V.42bis Modem for HP Palmtop Computers	U.S. Robotics	46

NETWORKING

456	Central Station	Arisoft Inc.	252
-----	-----------------	--------------	-----

457	JetLAN	ASP Computer Products Inc.	255
457	JetLAN/P	ASP Computer Products Inc.	255
458	Mosaic, Version 1.0	Bistream Inc.	257
551	PS-Print, Version 3.4	Brightwork Development Inc.	265
552	JetPress	Castelle Inc.	266
552	LANpress	Castelle Inc.	266
553	LANPrint	Digital Products Inc.	266
554	ExtendNet 2656	Extended Systems Inc.	268
554	Pocket Printer Server	Extended Systems Inc.	268
555	Printer Assist, Version 4.2F	Fresh Technology Co.	268
556	HP JetDirect Card for Ethernet	Hewlett-Packard Co.	268
557	LANSpool Software for NetWare, Version 3.50e	Intel Corp.	269
557	NetPort II Print Server	Intel Corp.	269
558	LANscript, Version 2.01	LANQuest Labs	270
559	PSERVER.NLM, Version 1.25	Novell Inc.	270
560	PrintQ LAN, Version 1.14	Software Directions Inc.	272
561	Network Assistant Plus VAP/NLM, Version 5.04	Third Planet Software Inc.	273

PRINTERS

405	Address Express	CoStar Corp.	60
420	IBM Color Jetprinter PS 4079	Lexmark International Inc.	48

READ ONLY

562	The Whole Internet User's Guide & Catalog	O'Reilly & Associates, Inc.	73
563	The Internet Companion: A Beginner's Guide to Global Networking	Addison-Wesley	73

SOFTWARE

421	Adobe Type Manager, Version 2.5	Adobe Systems Inc.	54
404	E-Quip-Workgroup Imaging	Alecity Systems Inc.	59
408	Command Center, Version 1.0	Artist Graphics	64
410	CA-Clipper, Version 5.2	Computer Associates International Inc.	64
411	CA-SuperProject for Windows, Version 3.0	Computer Associates International Inc.	64
432	WinSteuth Gold, Version 3.04	Dariens Inc.	56
431	CrossTalk for Windows, Version 2.0	DCA	46
428	WinFax PRO, Version 3.0	Delrina Technology Inc.	49
402	Freelance Graphics for Windows, Release 2.0	Lotus Development Corp.	59
410	StreetInfo 2.0	MapInfo Corp.	64
423	MapInfo, Version 1.0	MapInfo	44
426	Plug-In for Program Manager	Planet Crafters	56
406	Canyon Action!	The San Francisco Canyon Co.	60
413	Outside In for Windows, Version 2.0	Systems Compatibility Corp.	66
422	Immunity, Version 2.0	Unikrol Data Protection Systems Inc.	54
403	WordPerfect 5.2 for Windows	WordPerfect Corp.	59
430	PhotoFinish, Version 2.0	ZSoft Corp.	52

TOOLS

451	SourceSafe, Version 2.0	One Tree Software	77
-----	-------------------------	-------------------	----

TECHNICAL COLUMNS

User-to-User	Find the length of a string using a batch file.	316
User-to-User	A utility that hides the time and date stamp.	316
User-to-User	Find out how much free disk space there is on a hard disk.	316
Tutor	A Look Inside Windows Icons, Part 1.	318
Lab Notes	PCMCIA: The Expansion System of the Future.	321
Utilities	Bring Variety to Your Windows Desktop with CHANGER.	327
Environments	Working with OS/2 Bitmap Fonts.	333
Power Programming	Exploring Windows System Registry Performance Data.	339

SOLUTIONS

Operating Environments	Giving the Windows File Manager drag-and-drop editing.	358
Word Processing	A macro that centers multiple lines of text in WordPerfect 5.1.	366
Word Processing	The pros and cons of using exact line spacing in WinWord.	366
Spreadsheets	A macro-writing macro that helps you review graphs in 1-2-3.	374
Spreadsheets	How @IF treats labels in Quattro Pro.	374
Databases	A better way to choose colors for FoxPro applications.	384
Graphics	Predicting and solving PostScript problems.	392
Networking	Another way to check NetWare's RPRINT remote print server.	392
Networking	More insight on using public phones equipped with modem jacks.	392
Languages	Creating objects for Turbo Pascal programs.	399

After Hours

FLYING: Falcon 3.0; **Operation: Fighting Tiger;** Flying Fortress; **Aces of the Pacific;** Aircraft and Adventure Factory

FLYING

The Computer As Aircraft: Flight Simulators Take to the Skies

BY ALFRED POOR

Once upon a time, flight simulators only required a system with less than 256K of RAM, and that supported limited graphics. No more. The hotter your hardware, the better you fly. Besides demanding as much as 600K of memory, more than 8MB of storage, and nothing earlier than DOS 5.0, the three flight games we review here use sophisticated scanned graphics, and provide some of the most realistic action any PC game can offer.

SPECTRUM HOLOBYTE

Falcon 3.0

Operation: Fighting Tiger

Many flight sim fans will consider Falcon 3.0 the ultimate game. Spectrum HoloByte's \$79.95 offering enhances your skill in flying an F-16 Fighting Falcon, one of the best aircraft in service today. The game also provides provocative theaters, from Panama, Kuwait, and Israel in the original to Korea, Japan, and Pakistan in the add-on, Operation: Fighting Tiger. Best of all, would-be warri-

ors can compete across a Novell NetWare network or a modem line.

Game play is as serious as you make it. Novices can choose an instant-action mode, which has targets and action but few real dangers. Red Flag, a training activity, takes place at Nellis Air Force Base in southern Nevada, and teaches basic flight and air combat maneuvers. A third playing mode, Campaign, takes you to one of the three war zones and puts you in charge of a squadron of computer-controlled planes. In any mode, you can record each flight for later review.

Most intriguing, however, is Falcon's communications ability. Two people can play over a modem line, and as many as six can play over a NetWare-compatible LAN. Players can fly a campaign as a team or dogfight until only one aircraft remains.

State-of-the-art software demands state-of-the-art sup-

port. You'll want a 486-based PC, and you'll need DOS 5.0. The game requires at least 600K of conventional memory and as much extended memory as you can afford. You will also need 12MB of hard disk space. Network players need an expanded memory manager that can load network software into high memory; modem players need 2,400-bps or faster Hayes-compatible modems. Falcon 3.0 has to be installed on each player's PC.

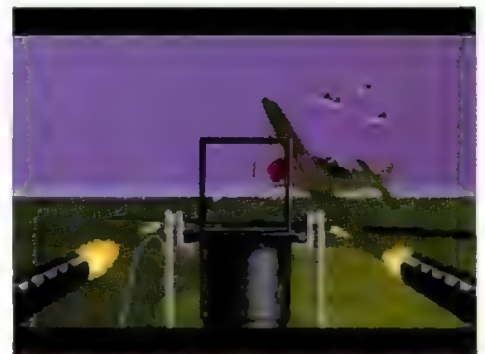
OPERATION: FIGHTING TIGER

What can you do once you've blasted the last bogey above Falcon 3.0's desert sands? You can get Operation: Fighting Tiger.

This add-on to Falcon 3.0, also \$79.95, is a combination of patches to the original game plus a collection of new files.

The most obvious additions in Operation: Fighting Tiger are the three new theaters of conflict, all in the Far East. In the Kurile Islands, a chain that extends from the Japanese island of Hokkaido to the Kamchatka peninsula, you are called in to help the Japanese recover this strategic stronghold from the Russians. In the second theater, you must fend off North Korea as it invades South Korea in an attempt to preempt political reunification. In the Kashmir, northeast of Pakistan, your squadron's mission is to support Pakistan's forces in a war with India.

The theaters have the same great graphics as the original Falcon. There is more to Operation: Fighting Tiger than new scenery, however. There are new digitized sounds for radio messages, and three new wingman controls. Landings are a little easier (though only a little) with the addition of VASI (Visual Approach Slope Indicator) lights to help you make sure you're coming



Bombs away! Flying Fortress makes you the bombardier, pilot, and crew aboard the Memphis Belle.



Falcon 3.0: State-of-the-art warfare for powerful PCs and serious network play.

in at the correct descent angle.

There is even a new weather pattern—you can encounter a thick cloud layer.

The Enemy Intelligence level in the configuration settings has been replaced by Campaign Difficulties—easy, standard, or hard—which determine how stiff the opposition will be and how frequently you will receive new supplies. The package also includes a wide range of new weapons, allied and enemy aircraft, and other resources that serve to support or threaten your missions.

The only potential downside to this upgrade is that it actually requires slightly more available system memory than the original; you now need at least 602K (616,448 bytes) of

Fighting Tiger

free conventional memory, so DOS 5.0 and its high memory facilities are a requirement. The upgrade also requires an additional 3MB of available disk space. The other drawback is that you will lose all your existing squadrons when you install the upgrade.

Operation: Fighting Tiger builds on the original game, while adding enough new features to maintain a level of challenge that will keep you working hard in the cockpit.

Falcon 3.0, \$79.95. Requires: 1MB RAM (4MB recommended), DOS 5.0, 12MB hard disk space. **Operation: Fighting Tiger**, \$79.95. Requires: *Falcon 3.0*; 3MB hard disk space. *Spectrum HoloByte*, 2061 Challenger Dr., Alameda, CA 94501; 800-695-4263; 510-569-4353; fax, 510-522-3587.

Circle 461 on reader service card

MICROPROSE SOFTWARE INC.

Flying Fortress

While fighter pilots have traditionally garnered the lion's share of fame and glory, bomber crews have always carried the bulk of the combat load. This was the case in the European Theater during World War II. If you've longed to try your hand at one of the positions on the Memphis Belle, Flying Fortress from MicroProse (\$69.95) will place you on the roster for a B-17 bound for missions across the English Channel.

The B-17 carried a crew of ten: pilot, copilot, navigator, bombardier, radio operator, and five gunners. Unlike most fighter combat simulations where one character is responsible for the entire plane, Flying Fortress puts you in all ten seats of the crew. You fend off

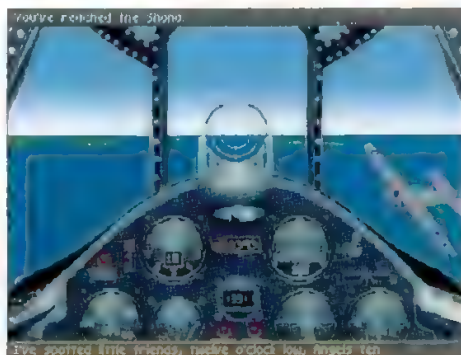
enemy fighters, receive and send radio messages, and maintain correct formation with the other planes as you put your load on the target.

While there is plenty of flying, the game requires lots of keyboard use and divided attention. You can put some of the activities under the computer's control (such as navigating to the next waypoint), but you still need to direct the actions of individual crew members at critical times to get full credit. The only task the computer will not do is land the plane.

The program comes with a short orientation book that includes a handy keyboard

guide. There is also a 230-page program manual printed on glossy, coated paper. This book is as much a history of WWII combat aviation as it is an instruction guide.

Though there's a lot to master, there are still long



Aces of the Pacific: Fast action and pure entertainment, but limited realism.

stretches where even the realistic 256-color scenery may grow tiresome. Fortunately, you can speed up time, either by accelerating the clock or

jumping a preset interval.

As you complete missions, you rise in rank and receive decorations. Complete 25 missions, and the crew's tour of duty ends. You can then select a new crew of green recruits, a new plane (complete with nose art), and launch for enemy targets again.

Flying Fortress, \$69.95.

Requires: 640K memory, DOS 3.0 or later (DOS 5.0 recommended), 6MB hard disk space. MicroProse Software Inc., 180 Lakefront Dr., Hunt Valley, MD 21030; 800-879-7529; 410-771-1151; fax, 410-771-9150.

Circle 462 on reader service card

DYNAMIX INC.

Aces of the Pacific

Dynamix's Aces of the Pacific takes you back to 1941, when the Japanese attacked Pearl

■ Rudder Control: Put the Pedal to the Metal

Many computer pilots are content to point their craft's nose in the direction they want to go, without regard to the finer points of aerodynamic realism. Some want more control, however: Why shouldn't you be able to control the ailerons on the wings separately from the rudder on the tail? Joysticks and flight yokes are fine for the ailerons, but for rudder control, only a set of foot pedals will do.

Until recently, there were few choices for rudder pedals. There are inexpensive models, but most are light and flimsy. Cheap pedals won't stay put as you mash your left foot down to maintain a side slip and battle a nasty crosswind. Or you can spend the price of a small hard disk for a heavy-duty model that looks like it has been cut right out of a Piper.

Now there is a middle-ground alternative: the Rudder Control System from ThrustMaster (\$149.95). The company is well-known for its joysticks and Weapons Control System, which are popular with the combat crowd, but the rudder pedals are

likely to be a hit with all flight sim fans.

The assembly is made of gold-anodized aluminum beams, with two large black plastic foot cups mounted a comfortable 12 inches apart. The unit weighs 5.5 pounds and has 6 rubber feet, which help it stay put when you're practicing your barrel rolls or Immelmann turns.

The Rudder Control System connects to the computer's game port. A two-headed cable allows you to connect a joystick or flight yoke as well. The pedals are compatible with Microsoft Flight Simulator and many other programs.

If you're looking for one piece of hardware that can make a significant improvement in your computer flying experience, but at a price that won't break the bank, the ThrustMaster Rudder Control System is a top-flight choice. □

Rudder Control System, \$149.95. Requires: PC with game port. ThrustMaster Inc., 10150 SW Nimbus Ave., Suite E-7, Tigard, OR 97223, 503-639-3200; fax, 503-620-8094. Circle 459 on reader service card

Aces

Harbor, and lets you try your hand as a pilot in combat in the Pacific during World War II.

As with most combat simulations, *Aces of the Pacific* (\$69.95) gives you many options. You can fly for the Navy, Marines, Army Air Force, or if you prefer, the Japanese; you can also choose one of 25 planes, including a P-39 Aircobra, a P-38 Lightning, a P-51 Mustang, a B-17 Flying Fortress, or a B-29 Superfortress.

LIMITED REALISM

This game emphasizes combat and entertainment. The program supports sophisticated add-ons, including ThrustMaster controls (see the sidebar "Rudder Control: Put the Pedal to the Metal"), rudder pedals, and sound cards, but the realism is limited. The planes are extremely stable and forgiving in flight, and the flight models appear to take substantial liberties with real-world physics. You start missions already lined up for take-off, and are given the option of returning to base automatically after you complete a mission. This option eliminates the hazards of finding the airfield and landing successfully. Graphics are only fair, with solid-color land, sea, and sky.

If you tire of patrolling from point A to point B on a mission, just engage the Autopilot and you will be transported to the next point of interest in an instant. This could either be the next scheduled waypoint, or simply a point where an enemy threat is nearby; the autopilot conveniently turns itself off whenever the enemy is near. This feature takes the edge off the realism, but makes it easy to move directly to the action.

And there's plenty of action to find. The various air-

craft do respond differently, and you may find yourself in a battle where your plane is overmatched by the enemy, or vice versa. There are many difficulty level configurations available, however, so you can make the game as easy or as hard as you want.

The simplified graphics also help keep the frame rate as high as possible, so you stand a better chance of keep-

ing track of friend and foe in a dogfight.

Choose either individual missions for arcade-style play or go for a military career and follow the war's progress across the Pacific. If you are skillful—and lucky—you'll survive to the end of the war.

If you want an aerial combat simulator that doesn't overload you with too many commands or too much tech-

nical complexity and that still provides a wide range of options, *Aces of the Pacific* should hit the mark.

Aces of the Pacific, \$69.95. Requires: 2MB RAM, DOS 5.0 or later, 8MB hard disk space. Dynamix Inc., P.O. Box 11806, Eugene, OR 97440; 800-326-6654, 503-343-0772; fax, 503-344-1754. Circle 458 on reader service card

FLYING

Design Your Own Airplane with Aircraft and Adventure Factory

BY ALFRED POOR

Microsoft Flight Simulator is reported to be the best-selling micro-computer game of all time. One of the reasons behind its continued success—in spite of the fact that there isn't much of a game to the program—is that it is endlessly extendable. With a wide range of hardware and software add-ons available, Flight Simulator has become the computer user's equivalent to the railroad hobbyist's HO layout in the basement.

Until now, however, Flight Simulator pilots had limited choices for designing their own aircraft. The designs had to look like Microsoft's basic planes, so you couldn't build a Beech Staggerwing or a Rutan Voyager.

This limit of the Flight Simulator world has changed dramatically with the release of a new add-on program: Mallard Software's Aircraft and Adventure Factory (AAF). BAO, the Bruce Artwick Organization, developed AAF, as well as Flight

Simulator add-on products such as the Sound, Graphics, & Airplane Upgrade.

AAF is really two programs in one, each of which more than justifies the \$35.95 list price. The first portion, Aircraft Factory, runs under Windows and lets you design and build just about anything you want. The second part of the package, the Adventure Factory, requires only a simple DOS text editor, and allows you to create highly realistic flying adventures.

MAKE YOUR OWN PLANE

Building a plane takes lots of patience. You need to start with scaled drawings of the three basic views: top, side, and front. You then create

blueprints on-screen, using a simple drafting module. Plans for individual parts are then taken to be manufactured. You also build up structures, such as a fuselage, by defining their top and side views and then fleshing them out using different shaped bulkheads. This means structures can have square or triangular cross-sections; you can even switch from one shape to another. As a result, you can produce remarkably realistic contours.

Assemble your structures and parts, send them to the painting room, and you have yourself a plane.

AAF even provides a minimally configured version of Flight Simulator so you can take a test flight and check your work before you leave the factory.

The best part about this package is that you don't need AAF to fly your newly made plane. The program can produce files that Flight Simulator can use directly. CompuServe's FSFORUM has a rapidly growing collection of planes available for downloading already, all created with AAF.

The program could use some improvements, such as a way to use the Windows Clipboard to move images onto the blueprint drawing surface. Still,



The ultimate add-on: AAF expands your Flight Simulator arsenal by letting you design your own planes and monitor your adventures.

AAF

the aircraft factory will make Flight Simulator's computer skies a lot more interesting now that flyers can go beyond the timeworn Cessna, Piper, and Lear-jet choices.

MAKE YOUR OWN EVENTS

The Adventure Factory portion of the program is less impressive at first glance, but stands to have a much greater impact in the end. The Adventure Factory makes it possible for the Flight Simulator to monitor conditions during a flight (such as airspeed, location, altitude, radio settings, and so forth) and then trigger events when certain conditions are met. These events can include typed messages that may appear on your screen, or playing digitized sound files—either through

your PC's speaker or through a supported sound card such as Sound Blaster, Pro Audio-Spectrum, or ATI. Events can also change the aircraft's position and display a .PCX image.

This may not seem revolutionary, but consider the possibilities. You could create an adventure file in which your flight instructor is in the seat next to you, speaking through your computer. The instructor could tell you when to pull back on the yoke or change your throttle setting, or when to turn or lower your flaps as you approach for a landing. It could make learning to fly on a computer much easier. The digitized voices could also be used for radio transmissions from tower and air traffic controllers; this greatly enhances the realism of the simulated flight experience. You could even have real games, where

the computer keeps score on how well you do.

The key detail, however, is that AAF puts the tools required to create these adventures in the hands of end users. As with the new airplanes, FSFORUM's download libraries already have user-created adventures free for the downloading. The digitized sound files are uncompressed .VOC files, and there is even a utility to convert Microsoft Wave (.WAV) files to this format.

The adventure portion has room for improvement, however. The sample adventure is little more than a technology demonstration, and the manual sheds little light on how to actually create an adventure file.

Fortunately, you can view the source file for the sample adventure, which you can then

use as a model for your files.

These are small problems, however, compared with the dual leaps that this program makes for Flight Simulator users. Now that you can fly nearly any plane from history or fantasy, and can create interactive scenarios for your flights, computer flying is more realistic than ever. With the Aircraft and Adventure Factory, the sky's the limit. □

Aircraft and Adventure

Factory, \$35.95. Requires: 80386-based PC; 2MB RAM (4MB recommended); Microsoft Windows 3.0.A or later; Microsoft Flight Simulator 4.0.B; 1.1MB hard disk space. Mallard Software Inc., 3207 Justin Rd., Flower Mound, TX 75028; 214-539-3570, 214-539-2575; fax, 214-539-5330.

Circle 460 on reader service card

**GET NONSTOP
SYSTEMS
INFORMATION...**

**AND 2
DISKS -
FREE!**



**Call toll-free today:
1-800-289-0429**

Don't miss a single product report or productivity-enhancing tip — subscribe to PC Magazine today. You'll get 22 issues for only \$29.97 — that's 54% off the \$64.90 cover price!

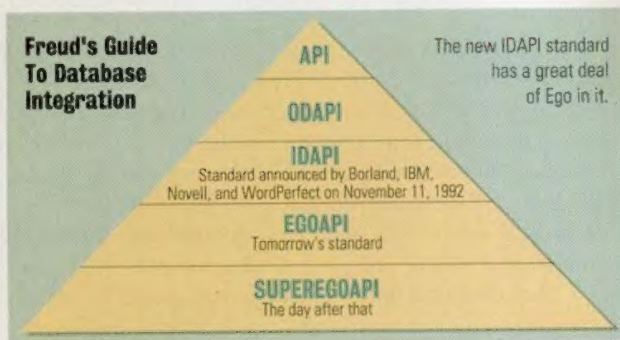
Order now and you'll also get PC Magazine's "Power Utilities for the '90s" on 2 disks — **FREE** with your paid subscription! These state-of-the-art utilities for the new generation feature a modular menu, and Systems, Windows and Laptop enhancers to boot! This exclusive software is available *only* to new subscribers!

Basic one-year subscription \$44.97; on newsstands \$64.90. Canada and foreign add \$32.00. U.S. funds only. Canada GST included. Please allow 30 days for shipment of first issue. FREE disks will be sent upon payment.

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Robin Raskin



All the Good Names Were Gone—Save One

According to local legend, TWAIN, the name of the Aldus standard for image acquisition, stands for *Technology Without an Interesting Name*.

Save a tree, kill your decor: a cure for the common clone from Personal Enclosures of Phoenix, Arizona.



Teach Your Children To Read?

"Even a very young child needs a little or no guidance in it's use. . . ."

—MACUSER, AS QUOTED ON THE PACKAGING FOR ALPHABET BLOCKS FROM SIERRA DISCOVERY SERIES



ARF Interactive

What's your pet name for Bill Gates?

(1) Dollar Bill

(2) Boy Billionaire

Send us your answers. We'll print the best.



10 YEARS AGO IN PC MAGAZINE

The CompuServe main menu, circa 1983. Some things never change.

Figure 1: The main menu as displayed after logging on to each network.

COMPUSEVERE MAIN MENU

- 1 Home Services
- 2 Business & Financial
- 3 Personal Computing
- 4 Services for Professionals
- 5 User Information
- 6 Index

THE SOURCE MAIN MENU

- 1 NEWS AND REFERENCE RESOURCES
- 2 BUSINESS/FINANCIAL MARKETS
- 3 CATALOGUE SHOPPING
- 4 HOME AND LEISURE
- 5 EDUCATION AND CAREER
- 6 MAIL AND COMMUNICATIONS
- 7 CREATING AND COMPUTING
- 8 SOURCE*PLUS

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Winners this issue: Lori Grunin (Twain tale), Bill Howard (PC decorating tip), Julie Cohen (foolproof Alphabet Blocks).

NOW THAT WE'RE SO FAR AHEAD OF THE COMPETITION, WE CAN AFFORD TO RELAX A BIT.

CUSTOMER SATISFACTION SURVEY

Source: Reliability Ratings™, 1992 PC Vendor Survey

SERVICE	TECHNICAL SUPPORT	PRICE	RELIABILITY	UPGRADEABILITY	FUNCTIONALITY	MONITOR	OVERALL SATISFACTION
1. DELL (8.62)	1. DELL (8.08)	1. DELL (8.62)	1. DELL (8.90)	1. DELL (8.52)	1. DELL (8.73)	1. DELL (8.31)	1. DELL (8.77)
2. APPLE (8.08)	2. IBM (7.98)	2. COMPAQ (8.62)	2. COMPAQ (8.89)	2. APPLE (7.64)	2. COMPAQ (8.45)	2. APPLE (8.08)	2. COMPAQ (8.45)
3. IBM (8.01)	3. APPLE (7.72)	3. APPLE (8.58)	3. APPLE (8.58)	3. COMPAQ (7.48)	3. APPLE (8.40)	3. COMPAQ (7.83)	3. APPLE (8.14)
4. COMPAQ (8.00)	4. COMPAQ (7.71)	4. IBM (8.01)	4. IBM (8.54)	4. IBM (8.91)	4. IBM (7.98)	4. IBM (7.38)	4. IBM (7.89)

Survey was independently conducted by Reliability Ratings, Inc., a subscriber-based research firm that does business with most of the FORTUNE 500.

DELL™

800-289-1450

WHEN CALLING, PLEASE REFERENCE #11BCB.

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.

IN CANADA, CALL 800-668-3021. IN MEXICO CITY, 228-7811.

**OUR NEW 486
ELIMINATES
MAINTENANCE
HASSLES.**

**IT ALSO KEEPS
THOSE
TIGHTWADS IN
ACCOUNTING
OFF YOUR BACK.**

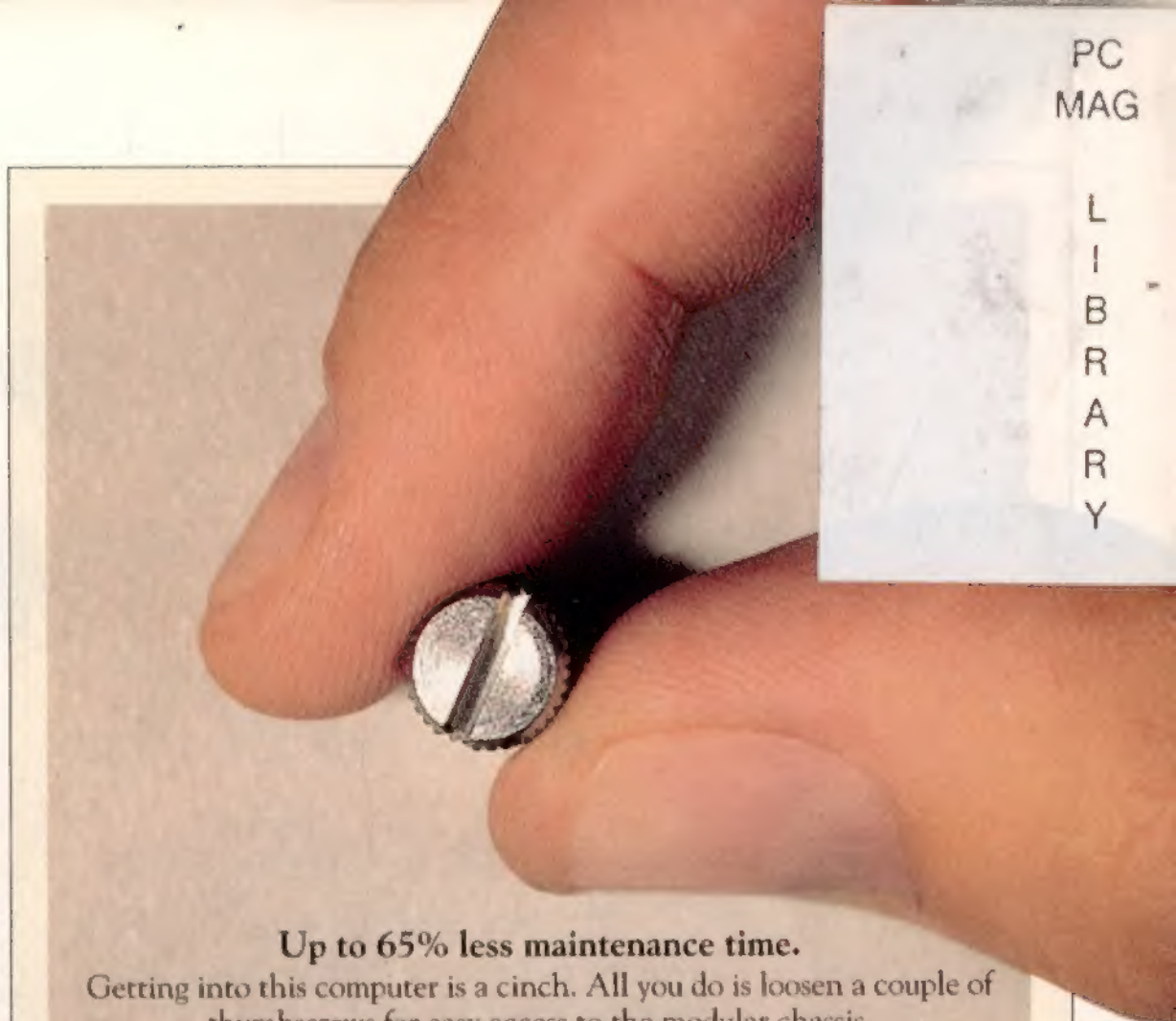


DELL

800-284-1210

WHEN CALLING, PLEASE REFERENCE #11BCA.

HOURS: 7AM-9PM CT MON-FRI, 8AM-4PM CT SAT, 10AM-3PM CT SUN.
IN CANADA, CALL 800-668-3021. IN MEXICO CITY, 228-7811.

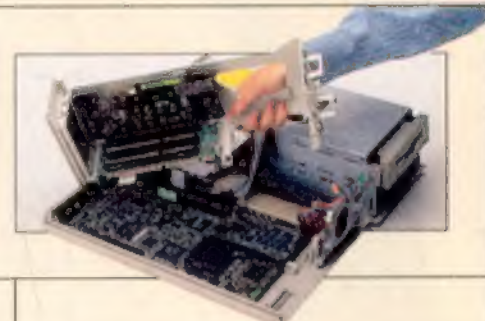


Up to 65% less maintenance time.

Getting into this computer is a cinch. All you do is loosen a couple of thumbscrews for easy access to the modular chassis.

Up to 65% faster access.

Want to upgrade video memory?
Add cache? Change the processor?
Just turn one more screw and lift
out the card cage.



Greater

upgradeability.

You can upgrade all
the way to the top
486, the 66 MHz
DX2. You'll even be
able to add the
Pentium™
microprocessor.



Guaranteed fast response.

Problems? Call us. We guarantee that
within five minutes you'll be talking to
a trained specialist. This kind of
personal service made us a FORTUNE
500® company in seven short years.



**THE NEW DELL® 425s/L
i486™ SX
25 MHz SYSTEM
\$1,499**

- LEASE¹: \$55/MO. •
- 4 MB RAM •
- 80 MB (17 ms) HARD DRIVE •
- 3 ISA EXPANSION SLOTS •
- UPGRADEABLE PROCESSOR •
- ACCELERATED LOCAL BUS VIDEO •
- WITH 512 KB VIDEO RAM •
- VGA 800 MONITOR •
- (14", 800 x 600, .39mm) •
- ONE FLOPPY DRIVE (3.5" or 5.25") •
- MS-DOS® 5.0 •



ALSO AVAILABLE IN 33 MHz i486 SX, 33 MHz i486 DX AND 50 AND 66 MHz i486 DX2 AND
THOUSANDS OF OTHER CONFIGURATIONS.



Up to 442% faster video performance.

You can thank our new accelerated local bus video
for that. The speed freaks in your office sure will.